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REMOVAL; RECOVERY.

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Read June 12th, 1888.

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Medical History of the Case, by Dr. GOWERS.

CAPT. G—, æt. 42, had good health until the year 1884. There was no history of syphilis. During 1883 and 1884 he endured much mental anxiety, and in the latter year he had a considerable mental shock—his wife was knocked down and run over in his presence, and he was able to save himself from a similar fate only by suddenly throwing him-self backwards. Soon afterwards he began to suffer from a dull pain across the lower part of the back, which he thought was due to the strain of the accident. This pain passed away in the course of a few weeks and did not return. In June, 1884, he first felt a peculiar pain that was the most

prominent symptom during the early part of his illness. It was localised in a spot beneath the lower part of the left scapula. This pain commenced suddenly one day while he was walking, and was continuous and severe for about a month. It was increased by active exertion and by the jolt-ing of a carriage. Repeated examination failed to reveal any cause for it. After a time it became less, but was felt occa-sionally through the autumn and winter. By the spring it had all but ceased, and he was asked to go out to China on business. Before undertaking the journey he consulted a physician in London, who pronounced the pain to be an intercostal neuralgia and suggested that the voyage would probably do good. While Capt. G— was in the train, on the way to Brindisi, the pain returned in severe degree, at the same place, and of the same character. During the voyage it continued, varying in severity, but when he reached China it was so intense, and was so much increased by movement, that he could scarcely walk. A German doctor at Shanghai, after a course of Turkish baths had been tried without benefit, expressed the opinion that an aneurism was the cause of the pain. Digitalis and iodide of potassium were given, and the latter was increased to large doses by two English practitioners at Shanghai, who doubted, however, whether there was an aneurism. The pulse became curiously variable, changing from 120 in the morning to 75 in the afternoon. The pain continued, and some fainting attacks occurred, one of which was thought to be possibly epileptic in character. In October, 1885, still suffering much and very prostrate, he left China for England. During the voyage he improved in health, the faintings ceased, and the pain lessened, so that in December, 1885, he could walk a little. Walking had been interfered with only by the pain. Other physicians were consulted, and the rest of the winter was passed in the South of France. The improvement continued, and by the spring of 1886 he was so much better that he went on to Constantinople on business. While there the pain almost ceased. He returned to England in the middle of the summer, and, as the pain

was still felt a little at times, he consulted other physicians
and by them was sent to Aix-la-Chapelle. While he was
there the pain returned in great severity and morphia was
injected. In September, 1886, he returned to England,
and the pain was then very severe, and, as before, was
increased by movement so that he was again scarcely able
to walk. The morphia was stopped and blisters applied.
An aneurism was again suggested as the probable cause
of the symptoms, and the use of morphia was resumed for a
time, but was again discontinued at the wish of the patient
himself. He became irritable; the continued pain seemed
to lessen his power of self-control. So marked, indeed, was
his mental state that the question was seriously raised
whether he was quite sane, and whether this mysterious
pain was anything like as severe as he described. He con-
tinued in this condition till the end of the year. In Feb-
ruary, 1887, he again came to London for advice and con-
sulted two physicians, who expressed the opinion that there
was no organic disease and advised him to go abroad. During
February and March there came on distinct loss of power
in the legs. The left leg first became weak and a few
weeks afterwards the right. In April he went abroad, and
remained away from England for two months. During this
time the weakness increased to complete loss of power,
sensation became impaired, and the urine was retained in the
bladder. Still the mental peculiarities were so conspicuous
to those around him that fresh doubts were felt as to the
reality of his symptoms, and it was suggested by someone
that he should be put through a course of the Weir-
Mitchell treatment. Before this step was taken another
opinion was thought desirable, and the patient was brought
to London for the purpose on June 4th. I saw him on
the following day, in consultation with Dr. Percy Kidd,
who was connected with the patient but had not had any-
thing to do with the previous treatment.

The condition then presented by Captain G— was that
characteristic of grave organic disease of the dorsal region
of the spinal cord. There was absolute motor palsy of the

legs, and cutaneous sensibility of all kinds was lost as high as the ensiform cartilage. At and just above this level, that is, in the region of the sixth and seventh intercostal nerves, he complained of severe pain around the chest, much more severe on the left side than on the right, and increased to evident agony on any movement. The legs from time to time became rigid in extensor spasm, and a clonus could be obtained with great readiness in the muscles of the calf and front of the thigh. The paroxysms of spasm involved also the muscles of the abdomen. The bladder was distended, and the urine that was drawn off contained pus. There was no irregularity of the vertebral column, nor could tenderness be discovered in any part. No trace of pulsation could be felt in its vicinity, and no murmur could be heard on auscultation. The thoracic organs seemed healthy, and both lungs were equally filled with air.

The development of complete paraplegia, which had taken place during the preceding four months, rendered the diagnosis, up to a certain point, a simple matter. The symptoms were those characteristic of a transverse lesion of the cord a little above the middle of the dorsal region. The gradual onset of the paralysis, the affection of one leg before the other, and the long-preceding signs of nerve irritation at the level of the lesion, made it practically certain that the spinal cord was damaged by compression and that the cause of the pressure was outside the cord itself. Caries of the spine was excluded by the absence of any irregularity of the spines or tenderness, taken in conjunction with the long duration of the symptoms. The diagnosis lay between an aneurism eroding the vertebræ and compressing the cord, a growth springing from the bones of the spine, and an intraspinal tumour within the canal, but outside the cord itself. Although aneurism could not be completely excluded, the absence of any of the characteristic physical signs of aneurism, and the absence of any indication of weakening of the spinal column, made this cause of compression far less probable than one of the two others. The distinction of a

tumour of the bones from one within the canal can only be a matter of certainty when the enlargement of the bones, caused by the former, can be felt. In other cases the diagnosis can only be a matter of probability, and often of very low probability. A growth backwards from the bodies of the vertebræ may cause symptoms undistinguishable from those due to a tumour springing from the membranes. In this case, however, the symptom of longest duration, the pain, pointed to irritation of the posterior roots on the left side, and therefore to a lateral position of the growth, and the affection of the left leg before the right had the same significance. A growth from the bone on one side of the cord would be more likely to cause recognisable enlargement of the parts, than would one springing from the bodies of the vertebræ, and the absence of such enlargement in this case was therefore somewhat in favour of the growth being altogether within the canal.

The course of the symptoms, coupled with the inutility of iodide of potassium, precluded the supposition that the disease was syphilitic. The long duration of the symptoms in slight degree was in favour of the non-malignant character of any growth that might exist.

In a description of tumours within the spinal canal,[1] I had previously suggested that the removal of spinal meningeal growths would be not only practicable but actually a less formidable operation than the removal of intracranial tumours. In this case the patient and his friends were exceedingly anxious that something should, if possible, be attempted. An operation gave a chance, the only chance, of cure. If the tumour should turn out to be one that could not be extirpated, it was possible that the removal of an arch, or the division of nerve-roots passing into the growth, might lessen the sufferings of the patient. If nothing were done, death after months of intense suffering was inevitable.

Sir William Jenner saw the patient with Dr. Percy Kidd and myself, and concurred in the probable diagnosis of a growth. The question of an operation was submitted to

[1] 'Manual of Diseases of the Nervous System,' vol. i, p. 432.

him and received his sanction, provided the patient himself clearly understood the nature of the operation and that a perfectly successful result was not more than a possibility. Capt. G— was, however, only too anxious to submit to anything that held out the faintest hope of relief. Accordingly Mr. Horsley was asked to see the patient, and, if he saw fit, to operate.

Surgical History of the Case, by Mr. VICTOR HORSLEY.

I saw Captain G— on the 9th of June, 1887, at 1 p.m. The patient was half sitting up, complaining of paroxysms of very great pain in the lower limbs and abdomen, the former being completely paralysed and frequently flexed in clonic spasm, the pain accompanying which was so severe as to cause the patient to cry out. On careful examination of his spine, there appeared no undue prominence of any vertebra, and the only abnormality detected was tenderness on pressure to the left side of the sixth dorsal spine. This was very constant though slight; on movement the patient complained of a sensation of weakness (rather than pain) referred to the middle of the dorsal region, but such movement did not seem to start the spasm in the legs by interference with, or pressure upon, the spinal cord. He was very loth to move because it necessitated voluntary change of position of his legs, movement of any of the joints of which was liable to bring on a severe paroxysm of painful flexion. In addition to the complete loss of motor power just noted, there was loss of tactile sensibility as high as, and involving the destruction of, the fifth dorsal nerve. There was some doubtful diminution of sensibility in the left fourth intercostal space, but this could not be satisfactorily demonstrated when I saw the patient.[1] On the right side the insensibility was limited to the fifth interspace. The anæsthesia was complete for all kinds of stimulus.

[1] This slight affection of the left fourth nerve was nevertheless of great diagnostic importance as the sequel of the operation shows (see p. 11).

There was complete loss of power over the bladder and rectum, and catheterisation had been found difficult with a metal instrument on account of the severity of the urethral spasm thus excited. (After the operation, when the spasmodic condition was equally severe, the passage of a soft rubber catheter was unattended by this trouble.)

The morning temperature during the week preceding the operation varied from 97·4° to 99·2°, and the evening temperature between 99° and 99·4°.

For the history and present state see the foregoing description by Dr. Gowers.

Operation.—June 9th, 3.30 p.m. Present: Drs. Gowers, Percy Kidd, and Edmunds. Mr. White anæsthetised the patient with ether while he was lying in the semi-prone position on the right side, and I was kindly assisted by Mr. Stedman and Mr. Ballance. The skin was shaved and thoroughly cleaned with ether and 5 per cent. carbolic acid solution, the spray was used throughout the operation, and the instruments and sponges were kept in 5 per cent. carbolic solution. Free incision was then made in the middle line through the skin and the subcutaneous tissues extending from the third dorsal spine to the seventh. The deep fascia and tendinous attachments of the muscles were then cut from the spines and a transverse cut was carried outwards from the spines over the spinous muscles through the vertebral aponeurosis, so as to prevent all tension on the sides of the wound. (See Remarks.) Vessels bled freely by the sides of, and between, the spinous processes, and were secured with Wells's forceps. The muscles were then completely detached from the spinous processes, from the laminæ, and from the mesial aspect of the transverse processes. This was done in a way which I shall refer to later, namely, by free use of the knife, and subsequently blocking the wound with sponges, while the same procedure was carried out on the other side of the spinal column. The sides of the wound being now strongly retracted and most of the vessels ligatured, the spines and laminæ could be seen perfectly.

The fourth, fifth, and sixth dorsal spines were then cut off
close to their bases with powerful bone forceps, the laminal
arch of the fifth vertebra was then trephined with a three
quarters of an inch trephine, the pin being placed in the
middle line.   The bone was very hard and tough and one
sixteenth of an inch thick.   The rest of the laminæ were
then removed with a bone forceps and knife, the ligamenta
subflava giving much trouble owing to their toughness.
The laminal arches of the fourth, fifth, and sixth vertebræ
being thus cleared away, the dura mater was easily exposed
by an incision in the middle line through the fat covering
it.   This fat, being pressed aside, shrank and showed the
dura mater of a normal appearance, colour, and tension.
Nothing very abnormal was then observed, save that on the
left side the dura mater was distinctly pressed nearer to the
bony wall of the neural canal.   This, of course, was due to
the fact that the tumour lay on the left side of the cord,
and consequently pressed the dura mater on that side
closer to the vertebræ.   The wound being practically
bloodless, the dura mater was slit open in the middle line
with a knife and dissecting forceps.   The cerebro-spinal
fluid escaped freely, but not with any undue pressure to
signify pathological tension.   The spinal cord was now
exposed for about two inches and appeared to be perfectly
natural in colour and density; moreover, the vessels cours-
ing on its surface were in every respect normal.

It will now be readily understood that the upper part of
the roots of the sixth nerve and the whole course of the
fifth nerve on each side from the spinal cord to the intra-
vertebral foramen was completely exposed.   Examination
of the spinal cord on all sides with the finger and cautiously
with an aneurism needle failed to reveal anything abnormal.
Another lamina was removed at each end of the wound,
the dura mater as before slit up, and the cord still further
exposed, but still nothing pathological was discovered.   At
this juncture it appeared as if sufficient had been done, but
I was very unwilling to leave the matter undecided, and
my friend Mr. Ballance being strongly of the opinion that

further exposure of the cord was indicated, I determined
to go further if the state of the patient warranted me in so
doing. Finding that his pulse was very strong, and that
there would be no difficulty whatever in the anæsthetisation,
I removed another lamina at the upper part of the incision.
On opening the dura mater I saw on the left side of the
subdural cavity a round, dark, bluish mass about three
millimetres in diameter, resting upon the left lateral column
and posterior root-zone of the spinal cord. I recognised it
at once to be the lower end of a new growth, and therefore
quickly cut away the major part of the lamina next above.
This enabled me to see almost the whole extent of the
tumour when the dura mater was divided. It was an .oval
or almond-shaped body of a dark, bluish-red colour, resting
upon, and attached at its lower extremity to, the highest
root of the left fourth dorsal nerve,[1] just where the poste-
rior nerve-roots were gathered together in one trunk. On
palpation the tumour markedly fluctuated. Above, it
extended as far as the third dorsal nerve to which it
appeared to be loosely attached by connective tissue,
evidently a fold of the arachnoid. The tumour occupied
exactly the position of the point of the ligamentum denti-
culatum, being jammed between the dura mater and the
left side of the spinal cord. The pia mater and the arach-
noidal sheath of the spinal cord evidently passed contin-
uously from the cord over the surface of the tumour, forming
a kind of capsule on its upper surface. At the same time
it seemed as if the tumour could be pressed away from the
spinal cord, so as to give the idea of its not actually invad-
ing the substance of the cord. I therefore made an incision
through the pia matral sheath of the spinal cord, and then
found that I could easily dissect the tumour from the
surface of the cord, lifting it out of the deep bed which it
had formed for itself in the lateral column of the cord. It
was easily detached above by cutting through the loose
tissue before described. Below, as it was firmly adherent

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[1] The growth was found by measurement (at the operation) to be situated
four inches above the level of complete anæsthesia.

to the fourth dorsal nerve, and as that nerve was of course of insignificant importance, I cut away the portion of nerve adherent to the growth. The outer border of the tumour was bathed in the cerebro-spinal fluid, and so required no dissection, but in removing the growth its inner surface, formerly of course in close contact with the cord, apparently gave way and some turbid serous fluid escaped, this reducing the volume of the tumour to about three fifths of its former size. (For description of the tumour *vide infra.*)

The cavity left by the removal of the growth was of course for the most part simply the subdural space, but the spinal cord was evidently greatly damaged by the pressure of the growth. The lateral column was so depressed or notched, so to speak, that the bottom of the groove in it nearly reached the middle line of the cord. It seemed likely, therefore, that most of the fibres in this column would be completely destroyed, moreover, there was evidently no resiliency in the damaged cord, for during the time that it was under observation the bottom of this pit showed no tendency whatever to rise. The surrounding adhesions of loose connective tissue oozed rather freely, but gentle pressure with a fragment of sponge for a few minutes soon arrested this bleeding. The cord and subdural space was then carefully sponged with 5 per cent. carbolic acid solution and freed from blood-clot. The edges of the long incision in the dura mater were then approximated (incision fully four inches) and laid in position but not sutured at all. The few remaining vessels were ligatured, and the sides of the wound brought together by strong silk sutures passed vertically with curved needles through almost the whole thickness of the side of the wound, and at a distance of about half an inch from the border. These sutures were placed at distances of about one inch, and on being tied firmly were found to readily approximate the two sides of the cavity close to the dura mater. The edges of the skin were carefully approximated with numerous horsehair sutures, a small superficial

drainage-tube was placed at the lower extremity of the wound, and a long drainage-tube was placed vertically to the dura mater and reaching so far as that membrane at the upper end of the wound. The whole was then covered with a strip of carbolic gauze dipped in 5 per cent. carbolic solution, and a carbolic gauze dressing applied. The patient was put back to bed.

THE TUMOUR.—The growth, on microscopical examination, was found to be fibro-myxoma. It presents a nodular appearance, and the cavity referred to on p. 12 was found to be on the inferior and outer surface, being such a cystic space as
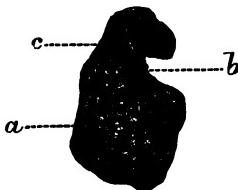
From a photograph of the tumour (natural size).

a. Points to the lobulated surface of the solid portion of the tumour, this producing the excavation of the cord.

b. Points to the open cavity in the tumour, this cavity being ruptured during the removal of the mass.

c. Shows the fibrous capsule forming part of the inner wall of the cystic cavity, and consisting of simple connective tissue, thus contrasting with the myxomatous tissue at *a.*

might have resulted from a hæmorrhage. The wall of the cavity was found to be a false capsule derived from the pia mater and arachnoid. Unfortunately its contents were lost in the operation. The mass of the growth on section was pale and homogeneous, but indications of separation into nodular masses could be seen here and there. The tumour was enveloped, as already described, in a thin capsule, and consequently the parts will best be described under the headings of *capsule* and *substance.*

(1) *Capsule.*—The capsule was formed of very delicate connective tissue in which the ground substance was obviously mucinoid, and in which numerous corpuscles were

embedded. The corpuscles were (*a*) leucocytes with darkly-staining round nuclei, (*b*) connective-tissue corpuscles with feebly-staining oval nuclei. Numerous large vessels with very thin walls (those of the veins in fact showing but one or two layers of muscle-fibres at the most) coursed through the exterior of the growth.

(2) *Substance.—Stroma.—*The stroma of the growth was composed of mucinoid ground substance and trabeculæ of spindle-shaped connective-tissue corpuscles closely applied to one another.

*Parenchyma.—*These trabeculæ marked off round spaces, which were entirely occupied with myxomatous connective tissue, *i. e.* mucinous ground substance which shrank greatly in alcohol, and in which were numerous corpuscles of varied shape. The nuclei of the corpuscles were (*a*) round and darkly staining, (*b*) oval and slightly staining, (*c* and *d*) ellipsoidal and spindle-shaped, darkly staining, and (*e*) very elongated, also darkly staining. These latter were as long and slender as the nuclei of involuntary muscle-corpuscles.

(3) *Vessels.—*A very few vessels were visible in the substance of the growth, and there were very small arterioles and venules with delicate walls of adventitia.

(4) *Pigment.—*In very many parts of the sections numerous collections of hæmatoidin granules were visible. In some instances these were obviously in corpuscles. No signs of any recent hæmorrhage, *i. e.* within a year or two, could be found.

Further Course of the Case.[1]

June 10th, 1887, 1 a.m.—Patient restless, complaining greatly of painful spasm in the legs and bladder, with sensation of distension of latter. Urine drawn off with soft catheter. The flow of urine was of the kind characteristic of complete paralysis of the bladder. No further change. Gr. ¼ of morphia given hypodermically.

[1] Owing to the length of the case it will be best to give as far as possible succinct *résumés* of the course of each leading symptom, &c.

9 a.m., temperature 97·6° F. (It may be stated here that the temperature throughout never reached 100° F., the highest recorded being 99·8° at 4 p.m. on June 11th, *i. e.* forty-eight hours after the operation. The temperature therefore will not be mentioned again, it being only needful to explain that its fluctuations were those of health, viz. low in the early morning and a little higher in the late afternoon.) Wound dressed, looked perfectly quiet. Tubes blocked with clot; cleared and replaced. Considerable amount of bloody serous discharge and cerebro-spinal fluid in the dressing.

On turning the patient over, a proceeding which was always difficult on account of the very severe pain in the abdomen and the left lower limb more especially, there was found an erythematous raised patch on the left side of the sacrum, but extending also across the middle line to the right side. The patch was about four inches broad and about three inches in vertical length on the left side, but only one inch on the right side. The nurse was positive that before the operation there was no such decubitus, and none was observed at the operation. This patch was immediately protected with boracic ointment spread on lint, and need not be again referred to, since it gradually disappeared, although on June 13th part of it in the centre of the gluteal fold appeared dusky, as though threatening necrosis of the skin. Fortunately it simply dried up.

11th.—Pulse 112. (The pulse varied very slightly after the operation, the rate gradually falling, thus on the 12th it was 108, on the 13th 95, and it varied between 90 and 100 till complete convalescence. Nothing was to be found to account for the high rate, except the pain. The patient still complained of much constant burning pain in abdomen, bladder, and limbs, in addition to which he suffered from violent painful spasm in the bladder and left leg especially. The left lower limb frequently flexed in spasm, but the right very rarely.

It need scarcely be stated that the indescribably excessive pain under which the patient laboured made examina-

tion of the limbs, &c., practically impossible, since the least touch excited the most violent clonic spasm, followed by tonic spasm, *i. e.* rigidity in extension, such spasm being agonisingly painful.

Urine.—Sp. gr. varied from 1024 to 1030. Strongly acid, no albumen or sugar. The urine never altered throughout, save a little in specific gravity, and therefore will also not be again referred to.

12th.—Wound dressed, uniting by first intention, though the edges looked reddish.[1] Discharge slightly serous, but enormous quantities of cerebro-spinal fluid escaped. The smaller (*i. e.* the lower) drainage-tube was removed, the higher left in. (This was an error; the tube should always be left out on the second day, so as to prevent the formation of a sinus along which the cerebro-spinal fluid by escaping may cause serious annoyance.)

13th.—The patient still complained of the incessant pain keeping him without sleep. Hypodermic injections of morphia in half-grain doses only gave half-hour snatches of troubled sleep, therefore draughts of chloral and bromide of potassium were given (Hyd. Chlor. gr. xv, Pot. Brom. gr. xc in the twenty-four hours, and these were continued in gradually diminishing quantities during the succeeding weeks until about the end of September).

The bowels being constipated, an enema was given with result. The urine was drawn off whenever the patient felt it distend the bladder, *i. e.* about every six hours, and when the amount of urine was usually seven ounces. It is important to note that the patient said that the distension of the bladder increased the spasm of the abdominal muscles. This spasm was tonic and never (?) relaxed until some two months after the operation.

14th.—Wound dressed, union still perfect. Dressing soaked, but this was less marked than on the 12th inst. At 6 p.m. this day, *i. e.* on the fifth day after the operation,

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[1] I have noticed this reddish colour of the edges and suture holes in another case where the cerebro-spinal fluid rendered the wound sodden, but in which nevertheless union also occurred by the first intention.

patient passed seven ounces of urine, and again at 9.30 p.m. six ounces. The micturition, however, was not " voluntary," but purely reflex action of the just recovered lumbar centre. The patient did not know when the urine escaped, although sensation was returning.

15th.—Sensation to touch now rapidly recovering, only the left foot being still anæsthetic. On account of the severe pain of the spasms excited by touching the limbs no further observations were made, i. e. as to transmission of painful impressions, of heat and cold, &c., but there is little doubt that as regards tactile and painful stimuli, sensation had returned by about the tenth day after the operation. There remained for some time a subjective sensation of heat in the left lower limb especially. Wound dressed; the remaining (the upper) drainage-tube was removed. The last time the catheter was used was 5 p.m. this day, the patient passing urine afterwards about ten times in the twenty-four hours, and about four ounces on the average each time, the rare extremes being two ounces and eight ounces.

On the 23rd, i. e. fourteen days after the operation, the frequency of micturition had diminished to six times in the twenty-four hours, i. e. normal. The constant pain was very severe and at times became excruciating, in fact the patient thought it was worse than before the operation.

16th.—The spasms by this day had gradually become restricted to the left side and lower limb, except when very severe. The cerebro-spinal fluid continued to ooze in considerable quantity through the small track of the upper drainage-tube.

22nd.—The patient steadily improved, the appetite returning, &c. This day he for the first time distinctly moved the right lower limb at the hip by " voluntary effort." On this occasion and also when (see below) the patient moved his left lower limb for the first time, he regarded the movement as only a spasm and not purposive, the muscular sense from disuse (?) being apparently deficient. (I have noted the same phenomenon in a case recently under my care in

which release by trephining of pressure on the spinal cord restored movement in the paralysed limbs.) The recovery of power spread down the limb to the foot.

At this time, however, the pain was still excessively severe at times, but was more paroxysmal, which was regarded, and rightly, as a favorable change.

July 20th.—About this date motor power returned in the left lower limb in the same manner as in the right limb, *i. e.* from the hip downwards. It is impossible to fix the date of this recovery as it was suspected for several days before the 20th, but the effort or initial spasm marred the observation, no aid forthcoming from the patient's sensations for the reason given above.

Further, the flow of cerebro-spinal fluid gradually diminished and ceased about six weeks after the operation. The arrest was aided by pressure with a pad of gauze and boracic acid over the sinus opening.

In this state, *i. e.* with recovered control of bladder and rectum, and with motion and sensation in the paralysed limbs, the patient was sent to the seaside on August 13th, 1887. The pain had gradually diminished and was confined to the left side.

A jacket consisting of a steel pelvic band from which shoulder crutches took origin, was applied to prevent possible kyphosis and to protect the cicatrix.[1]

Nov. 17th.—In answer to queries the patient wrote on this date, "I think I am making good progress. I take a daily turn in the garden with the aid of a couple of sticks, and also a daily drive for an hour. My back and legs are still very weak and at night I suffer a good bit of pain[2] and my sleep is broken, but I am in all respects much better. Though I walk with difficulty the movement of my legs is natural and tends to get better every day." At this time as from the end of July the legs were passively moved and rubbed.

[1] The state of the cicatrix is shown in Plate III.

[2] The pain was always worse at night, and for some time before it disappeared had but very rarely occurred in the day.

Jan. 24th, 1888.—This day the patient kindly allowed the members of the Society to inspect his back, &c. The only important point noticeable now in his condition was the character of the gait, which resembled that of a man rather stiff from fatigue. He could walk three miles with ease. The scar was very firm and indeed of almost bony hardness in the site of the fifth dorsal spine and arch. The patient was practically quite free from pain and discomfort and had very greatly increased in weight and muscular development.

Feb. 21st.—Seen again to-day; the patient's rapid progress continues, the gait is notably more free and natural than when last noted. Patient about to resume his professional work.

June 6th.—Letter received this day from patient states that he is in excellent health, of which the best evidence is that he recently did a sixteen hours day's work, including much standing and walking about.

Remarks.—This being the first case in which a tumour involving the spinal cord has been exposed and removed, it is very advisable that a full explanation should be given of the reasons which led to the adoption of the surgical procedure above described, and I think at the same time it is worth while to look back over the literature on the subject of tumours of the membranes of the spinal cord, and to see what light may thereby be thrown on this subject.

Method of Operating.

The operation of trephining the spine has been of course known to surgery since it was suggested by Heister. It has, however, hitherto been discussed with reference to cases of injuries of the spinal column.[1]

[1] It may be interesting here to reproduce Heister's suggestion. He says (' General System of Surgery,' 6th edit., 1757, p. 140), " But to offer the patient no assistance because we despair would seem cruel and uncharitable, therefore we must try our skill though our attempts should be in vain; in

Since it was suggested, this operation has been per-
formed, according to 'Erichsen's Surgery,' about thirty
times.   Before discussing its employment in these cases it
must be stated that ever since it was proposed this opera-
tion has met with the greatest opposition from some sur-
geons for various reasons, principally no doubt because it
was performed first in the prescientific epoch of surgery,
i. e. before the introduction of antiseptic principles by Sir
Joseph Lister, and consequently it obtained much of its
evil reputation from the frequency with which septic infec-
tion followed the exposure of the dura mater and the sub-
dural space.   But it has also been discarded by some on
account apparently of difficulties, &c., in its performance,
and in fact it is regarded by some as a very difficult as
well as dangerous operation.   For instance, Mr. Herbert
Page, in Heath's 'Directory of Surgery,' page 134, 1881,
referring to the treatment of fractures of the spine, says,
" The operation of trephining the spine, proposed many
years ago and adopted several times, has made no progress
in surgery, nor is it likely to do so . . . . It is an operation
not within the range of practical surgery."   In expressing
this opinion Mr. Page has no doubt been influenced by the
difficulties and dangers before referred to, but I would
submit that they have no real existence.

Mr. Erichsen, in the last edition of his 'Surgery,' says,
" The operation is not necessarily dangerous, it does not
appear often to have hastened death, and has certainly in
some cases afforded relief."   With regard to the latter
point I will discuss that when reviewing the cases I have
succeeded in collecting, and I think a description of the
mode of operating that I have adopted will show more
briefly than anything else the way in which many of the
so-called objections to the operation may be removed.   In
the first place the operation has been generally objected to
on account of:

order to which the surgeon must lay bare the fractured vertebræ with a
scalpel and replace or else remove. such fragments as injured the spinal
marrow."

1. Hæmorrhage.
2. Difficulty in clearing the neural canal.
3. Physical difficulties of treating the fractured vertebræ.
4. The hopeless nature of the damage of the spinal cord.
5. Septic infection.

Of these objections we may with advantage consider Nos. 1, 2, and 3 together. In the course of some experiments upon the spinal cord, which are fully detailed in 'Brain,' vol. ix, 1886, I found that the mode of operating upon the spine for complete exposure of the bones as given in the text-books, namely, by removing the muscles from the bones by means of a blunt instrument, so far from being the best means for preventing hæmorrhage, is the easiest way of producing it. The knife must be freely and rapidly used while the soft parts are strongly retracted. It must be noted here that in every case I have found it necessary to divide the deep fascia, not only along the spinous processes, but also at right angles opposite the middle of the incision in order to prevent it resisting proper separation of the sides of the wound, indeed, it may in some extreme cases be found necessary to divide the vertebral aponeurosis at more places than one. It need hardly be added that this division of the fascia has no influence upon the rapid healing of the wound. The free bleeding which follows the separation of the muscles from the bone is best met by seizing what bleeding points can be seen with Wells's forceps and then tightly and quickly packing the incision on one side of the spine with dry sponges while the operation is proceeded with elsewhere. In this way very free oozing may be arrested in a few minutes, and the time spent in waiting for it to stop is certainly not lost, because the subsequent division of the bones can only be properly carried out when the wound is perfectly dry, as it is when the above-mentioned method has been followed. The periosteum is best reflected, without impairing its vitality, by scraping the bones with a suitably curved elevator after the mass of muscle has been turned aside.

Next with regard to the removal of the laminæ of the

vertebræ.   If, of course, there is a fracture of the laminæ
or of the spine it will be detected at once by seizing the
bones individually in strong forceps and shaking them
(Erichsen), the fragment being easily extracted by dividing
with a knife the ligamentous attachment, and no damage
will be done to any important part if the edge be directed
towards the bone.   If now, however, the spine be perfectly
uninjured, as in the foregoing case, it becomes a matter of
great interest as to how we may most quickly remove the
bones.   From numerous experiments on dogs I have
adopted the following method : The spinous processes of
the vertebræ whose laminæ are to be removed are cut
through close to their base by very powerful bone forceps.
This is readily done in a few seconds and we then have the
laminæ forming a continuous if irregular plate, and this
can be perforated with a trephine with the usual precau-
tions.   The trephine should be almost as large as the dia-
meter of the neural canal, this of course varying with the
region operated on, the age of the patient, &c.   If more
than one arch is to be removed it will be better, by means
of an angular saw, to partly cut through the laminæ along
the lines of the sides of the neural canal, and then the
division of the bones can be completed with a bone forceps.

As in all these cases the wound cavity is necessarily
deep, its walls steep, and relatively very unyielding, I have
devised a form of bone forceps suitable for this stage of the
operation.   They simply consist of two ordinary bone
forceps cutting blades set at an angle of about 120° to two
short arms, which meet at the hinge and which are con-
tinuous with the ordinary long handles, the whole being
bent at the hinge in a sharp curve, so that they can be
employed to cut horizontally at the bottom of the cavity.
More difficult than the incision of the bone is the removal
of the ligamenta subflava.   These can only be quickly and
safely got rid of by steadily cutting with a sharp knife.
After removal of the bone, as is well known, we find the
dura mater covered with very vascular fat of a peculiar
nature.   This fat and loose connective tissue, if not treated

in the way about to be described, may be very troublesome indeed in causing free oozing of blood, and at the same time owing to its elasticity in obscuring the proper view of the dura mater. The numerous vessels supplying it of course come from the spinal arteries and the vertebral plexus of veins. Consequently, these are best avoided by keeping the incision in the fat strictly to the middle line. When this is done there will be very little bleeding at all, but at the same time the dura mater is completely covered by the fat. It can, however, be practically completely got rid of from the field of operation if it be retracted with broad retractors, and pressed against the sides of the neural canal for a few minutes or seconds while the dura mater is opened. This fatty tissue being very spongy seems to shrink under the pressure and remains practically out of sight during the remainder of the operation.

The next point to be considered is the treatment of the dura mater, &c. The dura mater, if opened in the middle line, will be found to admit of quite sufficient retraction to either side to expose the whole spinal cord and the sub-dural space. If of course the longitudinal incision in it be very short, say less than half an inch, it will be necessary to make a transverse incision as well in order to expose the whole breadth of the subdural region. But, as in the present instance, if incision be at all long, it is quite suffi-cient to restrict it to the middle line.

The next practical point is the escape of the cerebral fluid since on the first opening of the dura mater the cere-bro-spinal fluid wells up very freely indeed, fills the wound and prevents anything like accurate handling of the spinal cord. The best course to pursue is to keep mopping it out of the wound cavity with a sponge so long as it flows. If the patient be not moved and if the spine be horizontal and the head not raised, the flow of fluid will soon cease, and the spinal cord then becomes freely visible. After inspec-tion the spinal cord should be examined very gently by palpation, it being pressed against the bodies of the verte-bræ in front, so as to reveal any change in its density. If

it be suspected that some fragments of bone or a new growth may be pressing against the anterior surface of the cord from one of the vertebræ, it can best be detected by carefully passing an aneurism needle around the side of the cord, and exploring this aspect of it. In mentioning of course the opening of the dura mater, the escape of fluid, &c., due care will be taken to notice in the first place whether the dura mater is of normal appearance and whether there is any indication of its being inflamed or distended. It need hardly be stated here that of course if there is hæmorrhage beneath it it will appear dark, if pus yellow, &c. In cases where the theca is pressed backwards against the laminal arches, either from old traumatism or caries, &c., great care must be taken in perforating the laminæ with the trephine, but still more in raising the bone from the theca, for in such cases the dura is adherent to the anterior surface of the laminæ by firm fibrous adhesions, these requiring division with the knife.

A more difficult question, and one which requires experimental investigation at the present time, is the problem under what circumstances it is advisable to suture the incision in the dura mater or to leave it open. In the foregoing case, although the incision was relatively of very great extent, it was left open, but there can be little doubt that the union of the wound at the bottom of the uppermost drainage-tube canal would have been much more rapid if the dura mater had been even imperfectly closed by fine sutures.[1] There is another point which seems to me to be of practical interest, even if its existence be only theoretical. This is the possible cicatricial adhesion of the floor of the wound to the posterior surface of the dura and cord, and to the posterior roots of the nerves entering the same.

It has been long known to physiologists since the researches of Schiff in 1851, that the posterior columns of the cord are conductors of painful impressions, and this can be demonstrated on an animal which is completely

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[1] I have since sutured it with success.

narcotised with ether, so as to prevent the appreciation of
pain, in the following manner. If in such an animal the
various columns of the spinal cord be successively touched
with a sharp point or other mechanical irritant, no reflex,
i. e. involuntary, movements will result, except when the
posterior columns are touched. This fact, as well as
another mentioned below, is worthy of notice, inasmuch as
it makes a high degree of narcotisation necessary for the
performance of the operation under the best possible con-
ditions. The other fact I now refer to is the sensibility of
the dura mater. It is not apparently generally known
that the spinal dura mater is an exceedingly sensitive mem-
brane. In the dog this is particularly noticeable, and even
in an animal perfectly narcotised with ether, reflex move-
ments will occasionally occur when this membrane, like the
posterior columns of the spinal cord, is mechanically irri-
tated. It is very necessary, therefore, that when the dura
mater is about to be seized in forceps with the view of
opening it, or when similarly any delicate incision is to be
made in it or into the neighbourhood of the posterior
column of the cord, that the patient should be very deeply
under the influence of the anæsthetic to prevent any uncon-
scious reflex start, which might lead to very unfortunate
results.

To return, it will be readily understood now that possibly
as before stated the wide cicatrisation together of the floor
of the wound, the dura mater and the posterior roots of the
nerves might produce adhesion which would cause pain if
the spine were freely moved. This, however, after all may
be purely imaginary since in the present case, where all
these conditions must exist, the pain which occurred after
the operation was not attributable to this condition, since in
the first place it was merely a continuation of that which
the patient endured before the operation and moreover has
now disappeared.

4. *The hopeless nature of the damage of the spinal cord.*

The consideration of this part of the subject is important

of course only in those instances where the cord is diagnosed
to be completely softened or where the operation is under-
taken for the purpose of relieving the results of fracture
of the spine, the whole bearing of which we may very
properly now consider. I am the more anxious to do so since
I can make my meaning clearer by referring to a case of
Dr. Buzzard's, in which I performed the operation last
summer. The patient had fallen down a quarry and was
sent up from Derbyshire to the National Hospital for the
Paralysed and Epileptic in a very critical condition. There
was absolute paraplegia as regards movement and sensation
together with complete loss of control over the bladder and
rectum. The urine was already alkaline and contained
muco-pus. But the worst feature in the case was the ex-
istence of very severe and acute decubitus. Thus there was
a large spreading sore over the whole breadth of the sacrum,
extending especially deeply on the left side, sores over both
heels, and a bleb on the left thigh.

It was very clear indeed to Dr. Buzzard and myself that
unless the man was relieved from the most urgent symptoms
he must speedily die. Examination of the spine showed that
the spinous process of the eleventh dorsal vertebra was ap-
parently broader than natural and a little more prominent,
and at the same time very distinctly tender, in addition to
which the patient very distinctly referred to this region as
being the source of his weakness.

It was therefore decided to explore the seat of the frac-
ture and if possible to remove any portion of the bone which
might be pressing upon the spinal cord. The patient being
placed in a prone position, and anæsthetised with chloroform,
a longitudinal incision was made over the prominent ver-
tebra. The soft parts, as before detailed, reflected, and then
on grasping the spine of the eleventh dorsal vertebra it was
found to be movable, but jammed forwards between the
vertebræ above and below it. It was therefore seized in
lion forceps and removed by cutting all the ligamentous
bands attached to it. When it was extracted it was
evident that the posterior surface of the dura-matral sheath

was pressed backwards against the laminæ of the tenth
vertebra. This therefore was also removed. The dura
mater appeared perfectly normal. The theca therefore was
not opened posteriorly, but on exploring its anterior surface
and the bodies of the vertebræ with an aneurism needle a
small puncture was made into it from which there escaped
perfectly normal cerebro-spinal fluid. There was no
evidence of any previous severe compression of the dura
mater or its contents, and no evidence of hæmorrhage into
the same. The wound was therefore closed and a drainage-
tube placed opposite its middle; it was dressed strictly
antiseptically. The further progress of the case was one of
much interest; although the operation made no difference
whatever in the motor paralysis and only slightly improved
the sensory paralysis, it completely arrested the acute
decubitus, the sores ultimately healing firmly, and what
is still more interesting, from the time of the operation the
urine became acid.

The drainage-tube was removed on the second day and
the wound was completely healed at the end of seven days
without a trace of suppuration.

In this case no doubt the spinal cord was momentarily
jammed at the time of the accident so severely as to prac-
tically, *i.e.* functionally divide it. Though laminæ were
found compressing it at the time of operation, nevertheless
they did not do so so severely as to thereby alone cause the
excessive degree of the symptoms, therefore it would seem
that the cord, as suggested, must have been compressed at
the time of the accident. Now, this is just a case in which
if any attention had been paid to the ruling before quoted,
the patient's life would have been lost, and indeed it must
be obvious that, considering the necessarily small amount of
information on this subject, it should be our duty to operate
in every case, since we may possibly do some good, and cer-
tainly, if proper antiseptic precautions be taken, we can, to
use Mr. Erichsen's words, do no harm. This question of the
damage to the spinal cord not appearing to discount the pos-
sible benefit of surgical interference so much as has been

hitherto expected, gains additional illustration from the case which forms the subject of this paper, since nothing could well have appeared more hopeless than the indentation of the spinal cord produced by the tumour. This indentation appeared to divide the lateral column completely, and yet, owing doubtless to the gradual character of the compression, the restoration of motor and sensory function has been complete. I would repeat therefore that, so far from its being unjustifiable to operate on the spine owing to the possibility of the cord being hopelessly damaged, it seems to me to be criminal not to operate.[1]

5. *Septic infection.*

The possibility of septic injection following this operative procedure is of course exactly the same as that which attends any surgical interference, and needs only to be guarded against in precisely the same way, namely, by the Listerian principles of antiseptic surgery. No special liability to septic infection attends wounds in the region of the vertebræ, though of course the subdural space is undoubtedly an unusually favorable nidus for the organisms of putrefaction. As, however, I have repeatedly urged in discussing the surgery of the cranial cavity, this danger can be removed by the use of powerful disinfectants in a strong solution, *e. g.* 5 per cent. carbolic acid solution, &c., by irrigation of the wound during the operation, and this irrigation is afforded with the least inconvenience by the spray. The drainage of the wound is so extremely easy since the patient usually lies supine, that it can be completely provided for by a drainage-tube kept in for not more than forty-eight hours.

Summing up therefore, I think I have shown reason for regarding the operation of trephining the spine as a comparatively easy one, safe and justifiable, and that its reputed dangers are no more than those incidental to all wounds,

[1] Since this was written I have trephined the spine in two more instances, in both the wound healing without any complication whatever ; one, a fracture: the other a case of complete paralysis of all four limbs, &c., from severe caries of the second and third cervical vertebræ is now rapidly regaining power, being able to move both legs on the eighth day after operation, and the upper limbs later.

the only peculiarity being the fact that septic meningitis is practically a fatal accident, the avoidance of which, however, is well understood and provided for in 999 cases out of 1000.

We will therefore pass on to the review of the similar cases collected in the accompanying table.

Tumours of the membranes of the spinal cord.—I have been able, by referring to text-books and journals, to find accounts of fifty-eight cases, which I have arranged in the following table, which does not pretend to be exhaustive but I hope is sufficiently illustrative of the subject to warrant the conclusions which terminate this communication.

In this Table the facts relative to each case, so far as they have been recorded, I have arranged under headings which seemed to indicate the salient points upon which our future information must necessarily be full to admit of our making a correct diagnosis. Unfortunately, as will be seen, even the most fully recorded cases do not admit of close contrast one with another, owing in the vast majority of instances to the fact that their real nature was wholly unforeseen. Hence it may be well at some future time to draw attention to one or two points in comparative diagnosis, which need a more complete elucidation than is apparently forthcoming from the clinical records at our disposal. Especially is this required for cases where the active source of pressure is a parasitic cyst, and which, therefore, can only be treated by surgical operation. A collection of such cases has recently been made by Dr. Maguire, to whose paper in 'Brain,' January, 1888, p. 451, reference must be made for details, but I have inserted a few cases in the table by way of comparison.

The special want of information will be seen at once in the summary of the facts detailed in the Table, and in the history of the case, the subject of this paper.

The summary of the facts in the Table will be best arranged in the order of the headings to each column as follows :

Column 2.   a. Age.

Among the preliminary facts, the age of the patient, the subject of any of the diseases included in the table, is of course an important matter, since it will give aid sometimes in the diagnosis of the nature of the growth.

A.—EXTRADURAL GROWTHS.

1. *Lipoma.*—It is interesting to note that in the four cases of lipoma the extremes of the ages were 10 months and 4 years respectively, the average being 2¼ years. Since the nearest approach to this age is to be found under the heading of intradural tubercle (see below), it is evident that if we have presented to us a patient of such an early age with symptoms of compression of the spinal cord, the assumption that the growth is lipoma will be very strong indeed.   For further discussion of this important point see 'Nature of the Growth,' Column 24.

2. *Sarcoma.*—The kind of tumour which occurs next in the order of age is sarcoma, the average age of the patients being 18 years.

3. *Echinococcus.*—Next to this sarcoma is echinococcus (of course almost invariably extradural in any case), which attacks patients of an average age of 34 years (possibly less).

4. *Tubercle.*—It is interesting to find that tubercular mischief outside the spine causing fatal compression of the cord, apparently occurs in patients of an average age of 39 years.   I say apparently because the fatal cases are not numerous, whereas of course we frequently see non-fatal instances of pressure of the cord from extradural tubercular disease, usually spinal caries, in children.

The foregoing are the commonest forms of extradural disease.   The rarer, such as scirrhus or myxoma, occur beyond middle life, at 48 and 53 years in the table, as of course would be anticipated.

B. INTRADURAL GROWTHS.

1. *Myxoma.*—Included under this heading are pure myxoma, myxomata in which there is a considerable amount of fibrous tissue, and which therefore might by some be considered worthy to be put into a separate class entitled *Myxofibroma*, and lastly cases[1] in which no diagnosis is given, but which, nevertheless, from the description, are evidently of a similar nature. Under any circumstances the cases of undoubted myxoma outnumber the instances of any other kind of intradural growth. In a total of eleven cases the extremes of ages were 19 and 60 respectively, the resultant average being just over 43 years of age.

2. *Fibroma.*—At almost exactly the same age as myxoma, fibroma occurs; thus the average of the six cases was 44 years.

3. *Sarcoma.*—Similarly, sarcoma is noted to occur at the average age of 41 years.

4. *Psammoma.*—Contrasted with the foregoing tumours of youth and middle life on the average is psammoma. This growth, which has been recognised for many years as epitheliomatous, it is instructive to see occurs at an average age of 51 years. This is in harmony with the general facts recorded of the ages at which any of these neoplasms are likely to arise.

5. *Tubercle.*—One disease alone remains for special notice, namely, tubercle, which in its intradural form was found present on an average at the age of 18·5 years. Reference to the extradural form will show that that occurred most commonly at 39 years, due reservation being made as already stated. For general purposes, however, we may conclude that if we have evidence of an intradural growth in a person beyond 30 years of age, it is almost certainly not tubercle.

[1] As will be pointed out later, it seems likely that the results of traumatic hæmorrhage are included in this class.

Column 2.   b. Sex.

Of the total number of fifty-seven cases the sex is recorded in fifty-four, of which twenty-four were males and thirty females.

The preponderance of the female sex is the attribute of the intradural growths as contrasted with the extradural. Thus, in the former class of thirty-six cases fourteen were male and twenty-two female, while of the latter class of eighteen cases ten were male and eight female.

Why the female sex should more especially suffer is not easy to see. If the views expressed further respecting traumatism are correct, then the difficulty will be in a measure removed, for in the course of parturition we have an obvious source of intraspinal traumatic lesion.

This subject, however interesting, scarcely in our present knowledge admits of further profitable discussion; we will therefore pass on to consider the next point, viz. the alleged cause of the disease in each case.

Column 3.   Alleged Cause.

The discovery of a cause of the appearance of a new growth is in most cases a matter of considerable difficulty, and the origin of intraspinal mischief especially. It will, however, appear that some forms of new growth, either without or within the theca, do in their minute structure clearly suggest their mode of origin and source.

A. EXTRADURAL GROWTHS.

1. *Lipoma.*—In three of the four cases in the Table the fourth case probably supplies the clue, viz. congenital abnormality. The fat, which normally occupies much of the space between the theca and the neural canal, is highly vascular, and can easily be understood to occasionally take on a hypertrophic condition, which would lead to the fatal issue.

2. *Sarcoma.*—In three of the five cases to which a cause is assigned, we find it asserted to have been respectively "fall on the back," "exposure to cold," and secondary to primary disease elsewhere. I will return to the two former of these in summing up.

The causation of the remaining diseases does not call for special notice, owing to their pathology being known, with the exception of fibro-chondro-lipoma, in which again exposure to cold is alleged as the probable cause of the origin of the tumour.

B. INTRADURAL GROWTHS.

1. *Myxoma.*—Of the eleven instances of this tumour, cause is assigned in seven cases as follows:

Traumatism	2 cases.
Exposure to cold	2 cases.
Parturition	1 case.
Suppression of menses . . .	1 case.
Fright	1 case.

Possibly we should associate the third alleged cause with the first, and the fourth with the second.

2. *Fibroma.*—Of seven cases in which cause is alleged - it is described as follows:

Exposure to cold	3 cases.
Traumatism	2 cases.
Chlorosis	1 case.
Fatigue	1 case.

3. *Sarcoma.*—For this growth we find:

Exposure to cold	2 cases.
Traumatism	1 case.
Fit of anger	1 case.

4. *Psammoma.*—Cause given only once. Stated to have come on soon after parturition. ? Traumatism.

The other intradural conditions, such as tubercle, parasites, &c., require no description.

On addition of all the alleged causes of both extra- and intradural growths we find them to stand as follows:

Exposure to cold .   .   .   . 8 cases.
Traumatism .   .   .   .   . 8 cases.
Mental shock.   .   .   .   . 2 cases.
Chlorosis   .   .   .   .   . 1 case.
Fatigue .   .   .   .   . 1 case.
Congenital   .   .   .   .   . 1 ? 4.

Considering that these alleged causes are given·for only thirty-five[1] instances of disease, it is very remarkable that in almost one half of the total number of the cases thus recorded the cause should either be attributed to traumatism or exposure to cold, and this fact is of course greatly strengthened by consideration of the whole number of twenty-one alleged causes no less than sixteen are ascribed to these excitants. To this must be added certain facts from the histories of the cases, which are but briefly alluded to in the Tables. Thus, in several instances of the traumatism and in many instances of exposure to cold, the leading and earliest symptom, i. e. pain, was noted to commence directly after the sufferance of the alleged cause. But more than that. We have, I think, direct evidence on this point of a more valuable kind, viz. that afforded by anatomical investigation, whilst if from the table we extract the eight cases of traumatic origin, we shall find that three must be put aside because the tumour was solid, or because not sufficient facts were known about it to enable us to express an opinion bearing upon the question at. issue. Of the remaining five, in two the symptoms were observed to follow directly upon the injury, so there is no question as to the real relation existing in them between the supposed cause and effect. These two cases are Nos. 24 and 44, and though classified according to the diagnosis as myxoma and fibroma respectively they are indubitably cystic formations so commonly set up by traumatic hæmorrhages in the membranes of the central nervous system. The records make this point perfectly clear, especially in Case 44, where the altered blood pigment is clearly described.

[1] The origin of the remaining twenty-three being known, e. g. tubercle, &c.

Passing now to Cases 46 and 32. In each I have had the opportunity of microscopically investigating the growth very thoroughly, and in each I have found scattered through the whole growth numerous collections of hæmatoidin granules, in many cases enclosed in corpuscles, as is so frequently seen in the neighbourhood of old extravasations of blood. At the same time there were no evidences whatever of recent hæmorrhages into the tumour substance such as occur in myxomata. Case 28, also classified as myxoma from its remarkable identity with 32, I strongly suspect to be due to the same morbid process, and this notion gains weight from the history of the case. '

HISTORY.

Column 4. Personal.

The personal history in such a heterogeneous mass of cases has little value. It is only of somewhat painful interest to note that in almost all instances of these invariable fatal cases, the patient was in perfect health before the commencement of the symptoms and nevertheless was condemned to an extremely painful and lingering death, although as a rule the mischief could have been readily removed by surgical interference.

Column 5. Family.

In the same way there are no facts of noteworthy value to be drawn from the records of the family history.

Column 6. Total duration of Symptoms.

Extradural growth—

Lipoma . .	Average about	1⅓ years.
Sarcoma . .	,,	9 months.
Echinococcus .	,,	6 months.
Tubercle . .	,,	1½ years.
Scirrhus . .	,,	1⅓ years.

5 yrs. 7 mos.

General average about 1 year, 1 month.

Intradural growth—

Myxoma	.	.	. Average	4¼ years.
Fibroma	.	.	. ,,	3½ years.
Sarcoma	.	.	. ,,	2 years.
Psammoma	.	.	,,	3⅓ years
Tubercle	.	.	. ,,	8 months
Parasitic cysts	.	.	,, (?)	9 months

14 yrs. 6 mos.

General average about 2 years 5 months.

From these figures it is evident how much more chronic are the symptoms when the mischief is within the theca than when outside it. Doubtless this is simply owing to the prevalence of the simpler forms of neoplasm among those growing from the spinal membranes. To whatever cause it may be due the fact is important in assisting the probable diagnosis.

Column 7.   Course of Symptoms.

Nothing obviously is of more importance than the special manner in which the symptoms are gradually developed. Unlike those occasional instances in which a cerebral tumour suddenly produces pressure symptoms, the spinal cord tumour seems practically never[1] to initiate such a condition. The only noteworthy exceptions being for the most part parasitic cysts which sometimes owing to the hydrostatic conditions under which they exist, suddenly enter the neural canal in some position of flexion of the spine. See Case 16.

Review of the whole number of cases, regarding them all as simple instances of mechanical pressure on the cord, is perfectly justifiable for the correct estimation of the relative sequence of a few symptoms, the remainder being considered in their development under their special headings in Columns 8 to 20.

[1] Sir B. Brodie in the 'Lancet,' pp. 378, 379, gives a case in which an intramedullary growth produced sudden paraplegia.

Column 8. I. Extradural Growths.

Of seventeen cases belonging to this class in which the course and development of the symptoms was fairly recorded, the first symptom was pain in seven cases, motor paralysis in six, the two combined in one case, motor and sensory paralysis combined in another, and finally muscular spasm in one case. Most frequently in the subsequent development of the chain of symptoms, sensory paralysis came later than motor, frequently the patient noticed the two to be developed simultaneously. Altogether twitchings of the muscles were recorded historically in but three cases see, however, Column 12.

The symptoms as a rule indicated diffuse pressure within the neural canal, for in only five[1] was there an approach to transfer of symptoms from one side to the other (right to left in three cases left to right in two). It is proper to add, however, that in four other cases the symptoms showed a tendency to be most marked on one side (the right in four cases the left in one).

Summing up we have thus ten cases in the seventeen in which there was an incomplete unilateral character in the symptoms.

However, the most important point in the development of the symptoms is of course the march, and in this extradural division of the cases it is clear that the commonest march would be **Pain, Motor paralysis, Sensory paralysis.** It being very distinctly understood that it is common in this condition to have the motor and sensory paralyses in close combination both in degree, relatively speaking, of course, and in time.

II. *Intradural Growths.*

In contrast to the comparatively frequent occurrence of ill-defined arrangement of symptoms in the extradural growth,

[1] *i. e.* 29 per cent.

we have in the intradural a most remarkably constant
march. Thus from a total of thirty-three available cases
twenty-one begin within pain as the first symptom, four pain
combined with motor paralysis as a first symptom, and but
six with motor paralysis alone. The subsequent march is
just as striking, the loss of motor power preceding sensory
paralysis in the very large majority of cases, indeed only in
four instances out of the total of thirty-three did sensory
paralysis precede motor. Therefore the march is easy to
write in these intradural cases, being **Pain, Motor paralysis,
Sensory paralysis.**

Of greater interest, and for diagnostic purposes of greater
value, are the facts relating to the transference of the
symptoms from one side of the body to the other, the
possibility of localisation of the growth being thereby of
course greatly increased.

Careful observation of such cases (as, for example, No. 50)
indeed reveals, in some instances, pathological effects such
as make the condition tantamount to hemisection of the
cord, so that we have reproduced clinically the classical ex-
periment of Brown-Séquard. But in the majority of cases
we have to derive our information from the unskilled ob-
servation of the patient or the friends, so that at the most
we learn that transference did occur. The transference in
this division of the cases is very different to that in the
extradural, inasmuch as in this variety the interval between
the invasion of the limbs successively affected is usually
weeks and occasionally months.

Of the thirty-three cases such marked transference was
noted in sixteen cases, *i. e.* 48 per cent., which is a great
advance upon the 29 per cent. of the extradural growths.
Of these sixteen cases in nine instances the transfer was
from the left to the right, in seven from right to left.

Grouping both divisions of the case together we find that
as soon as the paralytic symptoms are well developed, the
pain (for fuller details of which see the discussion of the
next column) becomes horribly exaggerated, then decubitus
occurs, and later the patient dies pyæmic or uræmic, by

septic absorption from the bedsores or from the decomposition of the urine.

Column 9.   Pain.

From the time of Cruveilhier the pain accompanying the development of intraspinal tumours has been reckoned with paralysis to be the most noteworthy symptom in the affection.   Its course is almost always insidious, excessively rarely is it sudden in its onset, being then obviously owing to hæmorrhage or rupture of a cyst.   At the first and indeed throughout the course of these cases they have almost invariably been diagnosed as rheumatism; consequently it behoves us to examine closely into its character to see whether there are not features peculiar to it which should prevent such a melancholy mistake in the future.   We will therefore go through the records of the pain in the tabulated cases from this standpoint.

First we note the immensely important fact that however severe the pain may be it is never referred to any part above the seat of the lesion.   To this there seems no exception.   Besides Case 32 there are several which show this most strikingly.   While thus the symptom is never placed above the lesion it is only localised below the lesion, a matter of extreme import to the operator in search of a tumour, &c.

If possible it would be most interesting to determine exactly the localisation of the pain as contrasted with the actual position of the tumour, because we should thus have, owing to the constancy of pain as a symptom, a powerful addition to the array of diagnostic guides.   Although the records at our disposal are unfortunately greatly wanting in this respect, those cases which do point to some conclusion on this question had better now be referred to in a little detail.

Case 7. In this case the growth was situate from the sixth to the eighth dorsal vertebræ, i. e. bodies. The pain was referred to the distribution of the ninth dorsal nerve.   Simi-

larly in Case 32 the growth was opposite the third dorsal
vertebra (body), the pain being distributed in the area sup-
plied by the fifth nerve. In these two instances the
difference between the position of the growth and the
localisation of the pain was clearly due to the anatomical
relations of the nerve-organs and roots to the vertebræ, and
something more, viz. the as yet (in the human being) im-
perfectly known course of the fibres in the spinal cord.
Thus in Case 32, as is stated in the history of the operation
&c., the growth was diagnosed to be opposite the highest
root of the fifth nerve, i. e. localising it by means of the
pain and anesthesia, but as a matter of fact the tumour was
situated four inches above the zone of anæsthesia. It is
possible that the actual pressure of the growth upon the
cord produces much less effect on the intramedullary fibres
than one would expect, and this would seem to explain why
the ascent of the distribution of anæsthesia to the level of
the lesion is so very long in completely developing.
Extreme cases are those in which, as in Cases 11 and
13, extradural pressure, the lowest point of which was
the third dorsal vertebra in the one case and the fourth
dorsal vertebra in the other, produces pain referred to the
lower limbs. The other extreme, viz. perfect localisation
by means of the nerve, is to be seen in Case 28, where
invasion of the fifth dorsal root upon which the tumour
was sessile caused severe pain in the corresponding inter-
costal space. Probably also Case 46 is of a like character,
an example of intermediate cases for which no explanation
appears forthcoming save such as I have suggested in No.
41, where we have the pain for a long while referred to the
distribution of the ulnar nerve most particularly, although
the growth did not descend lower than the fifth cervical
vertebra, the ulnar nerve of course deriving most of its
fibres from the eighth cervical and the first dorsal. In this
last case there were certain vague pains felt in the neck and
shoulder, which of course might certainly be taken as sug-
gesting possible affection of the cervical nerves as high as
the fifth, but these were evidently insignificant compared

to the localisation of the pain to the distribution of the ulnar nerve. The only conclusions then that we can draw to guide us in this matter are, firstly, that if the pain be extremely well defined in the course of one nerve of one side then a lesion may be diagnosed to exist in the course of that nerve and so it may be localised with ease; secondly, that where there is no delimitation of the pain, but where the anæsthesia is apparently well marked and in accord with nerve-supply, it is necessary to be most cautious and to define if possible the upper border of the hyper- or paræsthetic zone which so usually surrounds the upper limit of the anæsthesia, but applying what has gone before, the proper course to follow will obviously be the exploration of the neural canal and its contents at the highest point that is suggested by any definite symptoms, and among such we should include even slight paræsthesia. Pain of a constant dull aching character seated in one fixed point in the spinal column is of course most valuable as indicating the focus of disease, but caution is requisite here again, and unless the limitation of the pain is very distinct it would be best to regard it as of slight value. If, though slight, it is accompanied by a symptom of which very little notice is taken, to judge by records, but one nevertheless of great value, namely, a sensation of weakness felt by the patient at that point in the spinal column, and if this sensation, which is of course subjective, be heightened by fatigue, then it assumes a leading position among the localising symptoms.

We may now proceed to consider[1] the character of the pain with regard to its diagnostic value. Noting usual forms first we must begin with the subjective sensation of burning, which occurred as frequently as in five out of the fifteen cases in which the pain was carefully described. In Case 32 this was extremely marked, the patient complaining that the whole of the left side and lower limb appeared to be red-hot and burning. In another patient the pain was described as roasting. This consequently

[1] In the intradural division only.

would appear to be an important fact to remember in dealing with painful conditions of the spine. The most frequent form of pain is that common to many affections, namely, shooting. In two instances it is described as pricking, in one as gnawing, and in one as stabbing, but little value attaches to solitary statements of this kind, especially as a full description is so seldom given. The next point is the relative amount of pain excited by the presence of the tumour. This, of course, is only to be correctly estimated in the intradural division of cases. Careful examination of the cases in which the pain is noted shows that even after eliminating possible errors it is a more prominent feature in those cases where the pressure is directed postero-anteriorly, and antero-posteriorly, than in those in which it is directed laterally. This is easy to understand in view of the fact that in the first two directions the pressure will directly influence the extremely sensitive posterior columns. The exceptions to this generalisation may be very striking, as, for instance, in Case 32.

It will not escape notice in the tables how almost invariably the pain in the lower limbs ascends from the soles of the feet in precisely the same manner as the anæsthesia is almost always subsequently developed.

Considering the extreme frequency of pain from tumours pressing on the spinal cord it is worth while glancing at those few instances in which pain is not recorded. In none of the cases of extradural lipoma is pain recorded. Probably this omission may be attributed in great part to the age of the patient, and has consequently been omitted from the records, but again it is not recorded in Cases 33, 35, 49, 57. Unfortunately these latter are just cases in which the notes are not so complete as could be wished, so that it would be hazardous to guess what the absence of record signifies. In view of the general obscurity of the subject, however, it is worth while to draw attention to the point.

Column 10. *a. Paralysis of Motion.*

Few things are more regrettable than the almost complete absence of record as to the mode in which the motor paralysis in these cases successively invades the various segments of the limb. So far as can be made out the advance of the paralysis is from above down. The patient in five cases of paralysis of the lower extremities was unable to stand before loss of the movements of the leg when lying down, and this form of early paresis was not necessarily accompanied by such sensory paralysis as produced ataxia. In one case of paralysis of the upper limb the result was different, the fingers being stated to be paralysed while the shoulder was only weakened. It is most desirable that this subject should be elucidated as soon as possible for the sake of prognosis as well as diagnosis, and all observations should be complete for each segment from the hip to the great toe, the representation of the latter being specially interesting.

b. *Paralysis of Sensation.*

The gradual abolition of sensibility appears in all cases to advance up the limbs from the soles of the feet. Here again the difference between the appreciation of various forms of sensory stimulation needs much careful examination in the future, and notably the contrast between pain, touch, and temperature (see Case 28).

Column 11. *Reflexes.*

In every case, without exception, if the cord were pressed upon, the reflexes both superficial and deep became greatly exaggerated. As the cord became completely destroyed

and descending degeneration and wasting marked, so the reflexes were gradually lost, the abolition beginning almost invariably with the plantar and passing upwards.

Column 12. *Spasms with Clonus.*

According to well-known facts, spasms and clonus (ankle and knee ?) were noted in the large majority (61 per cent.) of the intradural cases and in 35 per cent. of the extradural.   It is noteworthy that among the latter they were only recorded as accompanying the development of lipoma and echinococcus cysts.   The reason of this is not apparent.

The genesis of such spasms is slightly illustrated in the Table by but one case, No. 28, in which the spasms are noted as occurring on the same side as the tumour.   Hence we may obtain, on further examination of future cases, evidence as to the direct effect of pressure in this connection.

It is worth mentioning that in one case in which the spasms were originally most severe they disappeared one month before death, *i. e.* when the cord became so disintegrated as no longer to react to the irritation.

Column 13. *Rigidity.*

Closely connected with the foregoing column is that of rigidity.   Like spasm and clonus this is very much more frequent with intradural than extradural growths, the percentages of recorded occurrence being respectively 50 per cent. and 15 per cent.   Consequently, there is good reason for supposing that the existence of marked rigidity is evidence of intradural mischief.

A point of interest now arises.   In fourteen cases of intradural growth in which it was recorded, in eleven the attitude assumed by the contractured limb was that of flexion, in three that of extension.   One case suggests a

cause of this difference. In one instance in which the tumour was found on the right side of the spinal cord the right lower limbs were the seat of spasm in flexion, whereas the left lower limb was in extension. It would seem as if the growth specially induced irritation effects according to the intensity of the pressure employed. Thus, in the initial stages of the " pressure myelitis " the spasms may be those of extension, while in the final condition flexion predominates. The same thing may be noticed in the pressure myelitis resulting from fracture, dislocation of the spine, &c.

Column 14. *Decubitus.*

The formation of bedsores is of course the rule, and these are noted almost invariably in the cases of intradural growths as being terribly extensive. In many instances the buttocks are deeply excavated as far as the trochanters. In two cases (Nos. 47 and 32) the bedsore was situated on the same side of the body as the tumour, just as cerebral decubitus is seen on the opposite side to the nerve lesion.

For the effects of the decubitus see p. 53.

Column 15. *Nutrition.*

The nutrition of the paralysed parts is variously described as affected. Thus, in a few instances the change is mentioned as local, twice in the extradural and five times in the intradural growths. There is of course wasting when the growth penetrates an intervertebral foramen and destroys a nerve-root, but the instances in which local wasting occurs, e. g. of one lower limb as in Cases Nos. 24, 41, when the pressure is general are very rare. In eleven cases of both kinds of growth the wasting is described as general, and it may be that this general emaciation has led to supposed observation of local atrophy.

As a rule the nutrition is not impaired unless the paralysis be complicated with pyæmia, &c.

Column 16. *The Spine and its Physical Examination.*

This is a very interesting point, but not one from which much can be learnt, for out of the thirty-one cases (in both groups) in which the examination was made, it is distinctly stated in thirteen that nothing could be discovered.

Putting aside the six cases (five extra- and one intradural) in which the problem of diagnosis was obviously solved by the presence of an external tumour solid or containing fluid, we may proceed to note one or two important facts, although the number of cases remaining at our disposal is only twelve.

A review of these shows that the alterations in the spine produced by an *intradural* growth are as follows :

1. Tenderness on percussion.
2. Stiffness and weakness.
3. Curvature usually lateral.

The relation of each of these to the seat of the tumour is the most valuable evidence they offer, and that is as follows.

Perhaps the correspondence or want of the same will best be shown in parallel columns.   Thus :

Tenderness on pressure was felt at the	The tumour was situated at
Mid-dorsal region.	5th D. nerve.
10 D. V. and downward.	7 to 10 D. V.
1 to 4 C. V.	4 to 5 C. V.
5 to 7 C. V.	4 to 5 C. V.
1, 2, 3, 10 D. V.	2 to 3 D. Nerve.
7 C. V.	1 ? and 5 D. ?
6 D. V. (spinous process).	3 to 4 D. Nerve.

From this Table it appears that practically without exception a tumour occurring in the dorsal region is higher than the spot described as tender on pressure. In the cervical region this generalisation does not seem to hold so closely.   It need hardly be pointed out that the inclination of the nerve-roots goes far to explain this, but the cases

are too few and unfortunately but too rarely recorded in precise detail to admit of laying more weight on this point.

If "stiffness" be present it will be found to closely correspond with the portion of the tumour.

Similarly, if "curvature of the spine" is observed it will be found to be a secondary result of the tonic spasm of the spinous muscles, and therefore the concavity of the bend is on the same side as the growth. Removal of the source of the spasm, as in Case 32, restores the line of the spine.

Column 17. *The Pupils.*

As a symptom of this class of cases, change in the size and activity of the pupils only occurs when the cord is pressed upon above the level of the second dorsal nerve. When this happens, as in Case 4, the dilator fibres are of course paralysed, and the pupil becomes smaller than that of the opposite side, and almost immobile.

Column 18. *The Urine.*

As a rule the urine becomes retained in the bladder as the paraplegia is gradually developed, and following such retention comes decomposition and then cystitis. The organism (*Streptococcus pyogenes* ?) which sets up the cystitis gains access by the ureters to the kidneys, and there develops, causing interstitial nephritis, the usual direct cause of death in these cases. In but four cases is the urine recorded as normal, viz. extradural scirrhus, extradural tubercle, intradural fibroma *not causing paralysis of any kind*, intradural sarcoma in which rapid generalisation occurred.

It is curious to note that in the first two instances the lower limbs were œdematous. No change would be expected in the third case.

This is not the place to enter into any discussion as to the cause of the alkalinity of the retained urine and its

subsequent decomposition.   Suffice it to say that, as proved
on p. 27, the reaction does not depend on the introduction
of the *Micrococcus uræae* from without.

In the scirrhus case polyuria occurred.

Column 19.   *Vaso-motor changes.*

The changes which may be attributed to perverted vaso-
motor action are of course summed up in the word swelling.
This was noted but six times in the whole fifty-eight,
consequently it cannot be looked upon as an important
symptom.   Neither, unfortunately, can one learn from the
accounts of the case why it should have occurred even thus
rarely.

Column 20.   *Vomiting*

Was never present as a direct result of the cord mischief.

The circumstances which relate to the tumour must now
be grouped together for consideration.

Column 21.   *Relation to the Dura Mater.*

For every reason the relation of the growth to the dura is
of the first importance.   It has already been shown that we
may thus separate tumours of different nature as being
of practical certainty situated either inside or outside the
theca.   For the further bearings of this point on these
cases reference must be made to the foregoing pages.

Column 22.   *Size.*

The size of the growth in any particular case is limited
by the size of the theca, the amount of its lumen taken up
by the cord, &c.   As a rule the mass is oval or ellipsoidal,

Curves showing the Prevalence of Growths at different Points in the Spine.

I.—*Extradural.*
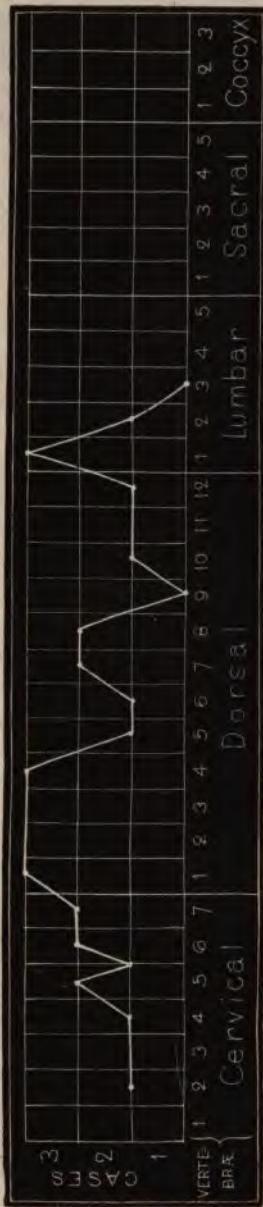
II.—*Intradural*
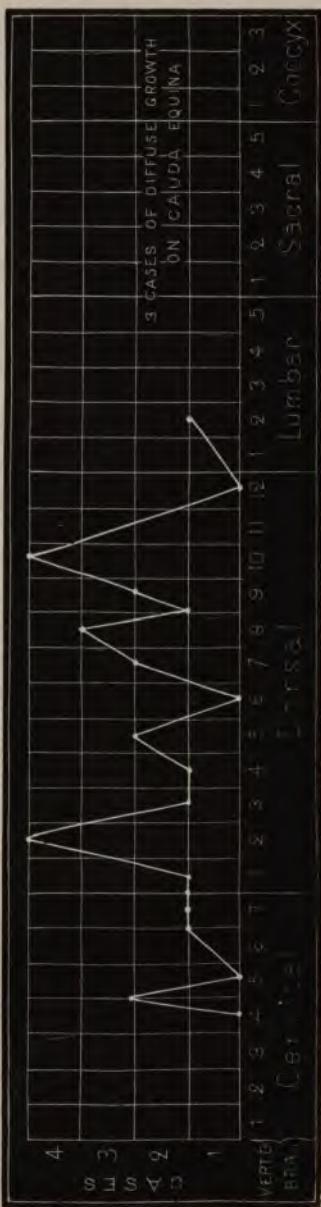
Note.—The curve in the extradural group is necessarily of much less value than No. II in that in individual cases in the upper dorsal region affected so many vertebræ as to prevent localisation.

the long axis being parallel to the middle line of the cord.
A necessary result of the variable position of the growth is
that tumours of the same size produce widely different
effects, consequently the size *per se* has little bearing on the
symptoms.

Column 23.   Position.

There are several ways in which the position of the
growth assumes importance, viz. :
  1. In relation to the causation of the growth.
  2. The relative effects of the growth. (*a*) According to
its vertical position on the cord. (*b*) According to its
horizontal position on the cord.
  (*a*) On grouping all the cases in the Table together, it is
at once obvious that most of the cases occur about the
following points in the spine :
  1. Just below the centre of the cervical region.
  2. The upper end of the dorsal region.
  3. The lower end of the dorsal region.
  These regions are those in which there is least intra-
thecal spare space. Moreover, just as the cases increase
in number from the cervical region downwards so the cord
becomes less and less firmly fixed in the theca. Whether
it is injudicious to regard all these facts as pointing to a
traumatic[1] origin of the majority of the growths time alone
will show. The cases in which there was good reason to
suppose that direct injury was the exciting cause of the
growth are not specially grouped around one of the above-
mentioned regions, so that until we have before us the
fuller and more accurate accounts of future cases we must
leave undecided the bearings of the position of the growth.
  It must be observed in passing that no one kind of
growth is peculiar to any one region of the spinal column.
  (*b*) The position of the growth in causing the produc-
tion of definite symptoms, according as to whether it is on
the anterior, posterior, or lateral columns, has already

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[1] *E.g.* including direct injury, changes of temperature, &c.

been in great part described. But it remains to be mentioned that the *relative* rapidity of development of the pressure in these tumour cases seems to have prevented such minute analysis as is possible in pressure of the cord from caries of the spine producing curvature. Moreover, the diagnosis having usually been wrong, and attention having been concentrated on the pain, the initial stages have been so badly described as to make it impossible to place much trust on the accounts, as explanatory of the influence of position.

Column 24. Nature of the Growth.

The nature of the growths is set forth in the headings of each division of the table, and as far as possible the details of the structure of the tumour are supplied in each case. Leaving out the parasitic cysts, &c., the conclusion from the list of names is obvious, namely, that almost all these tumours are those of the simple connective-tissue type, and that they spring from the arachnoid, or more rarely, from the pia mater. With the debated origin of psammoma we have nothing to do here, but the epitheloid covering of the arachnoid sufficiently indicates its possible source. Although too, as before stated, some of the diagnoses of the real nature of the growths are uncertain, still, whatever the kind asserted, there is one characteristic common to all the localised intradural kind which is of the highest importance. This is the fact that they are almost invariably covered with a thin capsule (derived from the arachnoid ?) and that their connection with the spinal cord is of the slightest. Consequently, they can be dissected from it without causing the slightest injury to a single nerve-fibre. In this connection reference may properly be made to the fact that since the tumours are as a rule of the simple connective-tissue type, extremely localised and slow growing (average duration of symptoms in intradural growths being about two and a half years, with the resul-

tant production of a small mass of tissue weighing a few drachms), recurrence after removal is not to be expected. In Case 32, the only one at our disposal for illustration of this point, there is not the slightest sign of recurrence one year after, nor is such probable.

Column 25.   Effect on the Cord.

The effect on the cord varies widely, even among growths of the same nature, of much the same size, and apparently producing much the same effects, as far as general symptoms are concerned, and in cases where much the same kind of secondary changes appear to have occurred (see, for instance, Cases 47 and 48).

The cord was softened (*vide infra*) more frequently with intradural than extradural growths, the percentage for the former being 55, and for the latter 46, of the cases in which changes in the cord were noted as present or not. When softening occurs it appears always to pass through the stages of congestion (this being almost always noted as occurring in the neighbourhood of the tumour), red softening, yellow softening, and grey degeneration. All these require no detailed account. So too when the softening has interrupted any of the great tracts of fibres in the cord there ensues ascending and descending degeneration of the ordinary kind and extent.

One further point with regard to the softening requires notice, and that is its distribution. Of course naturally it is most marked opposite the centre of the growth, but its farther extension is of course a matter of much importance and interest. Of six cases in which it is recorded to have occurred, in four it spread downwards and in two upwards, one very slightly. Doubtless this distribution is due to thrombosis of the great median medullary vessels.

Column 26.   *Treatment.*

For all the horrible sufferings of the fifty-eight cases in the Table, in only two was any treatment of avail, viz. Nos. 4 and 32.   In the former case excision of a part of the growth relieved the pressure, and so the symptoms for a time.   In the second the complete removal of the growth has, it may be hoped, obtained permanent relief.   Unfortunately the condition of the patient, owing to the errors of diagnosis, has usually been made more hopelessly miserable by free use of the actual cautery, moxas and blisters, while in other instances the additional employment of mercury, iodide of potassium, &c., has been resorted to.

Column 27. *Records of the Autopsy, especially with respect to the Presence or Absence of any other Lesion which, independently of the Tumour, would have caused Death.*

The melancholy inspired by consideration of Column 26 is intensified by the facts of Column 27, for in no less than 74 per cent. of the extradural growths, and 83 per cent. of the intradural, the patient died simply from the direct effects of the tumour, *i. e.* from exhaustion (in a very large number of cases), owing to pain, &c., or from pyæmia owing to absorption from the bedsores, or from septic pneumonia, or from acute septic interstitial nephritis.

Roughly speaking, therefore, about 80 per cent. of these miserable cases could have been relieved entirely by operation, and those which were hopeless might by relief of pressure have been granted a euthanasia.

The simple effects of confinement and nerve exhaustion are seen in the four instances in which fatty degeneration is noted among the effects of the intradural growths.

Conclusions.

The lessons of the facts detailed in the foregoing pages are so extremely obvious that very few words are required to set them forth. They amount to this, that, granted the diagnosis is correctly made, there is but one treatment, viz. removal of the source of pressure by operation. It may at once be said, and rightly, that the question of diagnosis in the large majority of cases arises when only as yet one cardinal symptom is before us, most commonly **pain**, and that therefore a diagnosis of such certainty as to warrant exploration is not possible. To this nothing can be objected in view of the responsibility the surgeon takes upon himself, but at least absolution from the major part of such responsibility is obtained with the discovery of the first localising symptom independent of the constancy, the position, and the character of the pain. The differential diagnosis of the cause of painful paraplegias, material for which is given in the table, considered fully, would be quite beyond the object of the present paper, and must be reserved for another occasion. A close survey of the conditions under which tumours have been found will meanwhile afford the best aid to the recognition of the real nature of doubtful cases.

DESCRIPTION OF PLATE III.

A Case of Tumour of the Spinal Cord (W. R. GOWERS, M.D., F.R.S., and VICTOR HORSLEY, B.S., F.R.S.).

A photograph was taken about July 31st which gives a view of the back of the patient, showing the scar of the operation. The spots around the scar are traces of small pustules, which, however, gave the patient practically no trouble, and which were caused no doubt by the irritation of the large quantity of cerebro-spinal fluid soaking the dressings and dissolving the perchloride of mercury, &c., contained therein.

PLATE III. MED. CHIR. TRANS. VOL. LXXI.

Vomiting.	a. Relation to dura.	b. Size.	
20	21	22	
—	Outside dura	Largest was 2 inches long (in fig.)	M ma of a ch
—	Outside the dura mater	Filled the whole breadth of the spinal canal	ext wh lu o co
—	External to dura	2½ inches long, "the breadth of the canal;" ¼ inch thick	Th cei do
—	(1) Outside the dura mater (removed successfully by operation). (2) Conical mass within the theca springing from the seat of original growth, and pushing the cord aside	(2)Resembled the end of the finger	(1) prol las wa rat po (2) sa th of lo
—	Outside the dura	—	co cor
—	Outside the dura	"Small" mass	Ov c
of	Frequent and severe (suffered much from bronchitis)	Outside the dura	Elongated and fusiform (see next column);	G th of th do po the an a
—	Outside the dura	Bantam's egg	Th ait 6th an n la

Hist

No. of case.	Sex, age.	Alleged cause.	Personal.	Family.	a. Tot dura tion.
1	2	3	4	5	6

Sarcoma (continued) :

| 9 | M. 10 | A fall on the back | — | — | — |

Tubercle :

10	M. 36	—	—	—	—
11	F. 60	None known	—	—	3½ yea
12	M. Middle aged	—	—	—	9 month crural but s sciatic Paresi and b 3 mon unimp
13	M. 24	—	Delicate	—	11¼ month
		—	Outside the dura		"Small"

Echinococcus Cysts :

| 14 | F. 22 | — | Good; pregnant at 8 mos. when first seen | — | 9 month |

lower extremities; no œdema nor ema
development of constant pain in the back
occasional tremors and engorgement of right
inclined backwards and to the right, with fi
the right eye was subject to tremors, flashe
eye symptoms disappeared later. At the
from the right arm, there followed complet
lysis in the right thigh, and later in the le
of bladder and rectum. Painless parturitio

| 15 | M. 42 | — | Perfect health | — | 6 month |

limbs, together
the same, noted
ptoms whatever
the same time
cold in the para

	d. Nature.	e. Effect on cord.	Treatment.	Result.	Autopsy note of other fatal lesion.	Reference.
	24	25	26	27	28	29
ly I ır. le	Two echinococcus cysts, containing daughter cysts	Excess of cerebro-spinal fluid. Cyst No. 1 flattened, for 3·5 cm. by 1·8 cm., the cord on the posterior surface of the left side, so that towards the upper border of the depression the cord was almost divided, there being only a flattened strip of cord left a few mm. broad, and very soft. Vessels in neighbourhood of both cysts very vascular; very empty at points compressed. Cyst No. 2 also compressed the cord, and rendered it soft	—	Death	Caseous mass in apex of left lung, œdema of lung, bronchitis, pyelitis, cystitis	Bartels, Kiel Deutsches Archiv für klinische Medicin, Bd. v, 1869, p. 108.
le ır- w ır- ır l. ls	Cysticercus	Appeared softened; doubtful, as decomposed	Blisters, Pot. Brom., arsenic, &c.	Death	Cysticerci in brain; nil else important	Westphal, Berliner klinische Wochenschrift, No. 43, 1865, p. 435.
)f b ;	Hard, opaque, yellow, amorphous	—	—	Death	Few gummata in liver and lungs	Wilks, Guy's Hosp. Reports, 3rd series, vol. ix, p. 50, 1863.
ıce he	Not stated	Spinal cord was slightly flattened by the growth, but otherwise quite healthy	—	Death	Nothing noted	Leyden, Klinik der Rückenmarks Krankheiten, Band i, 1874, p. 468.
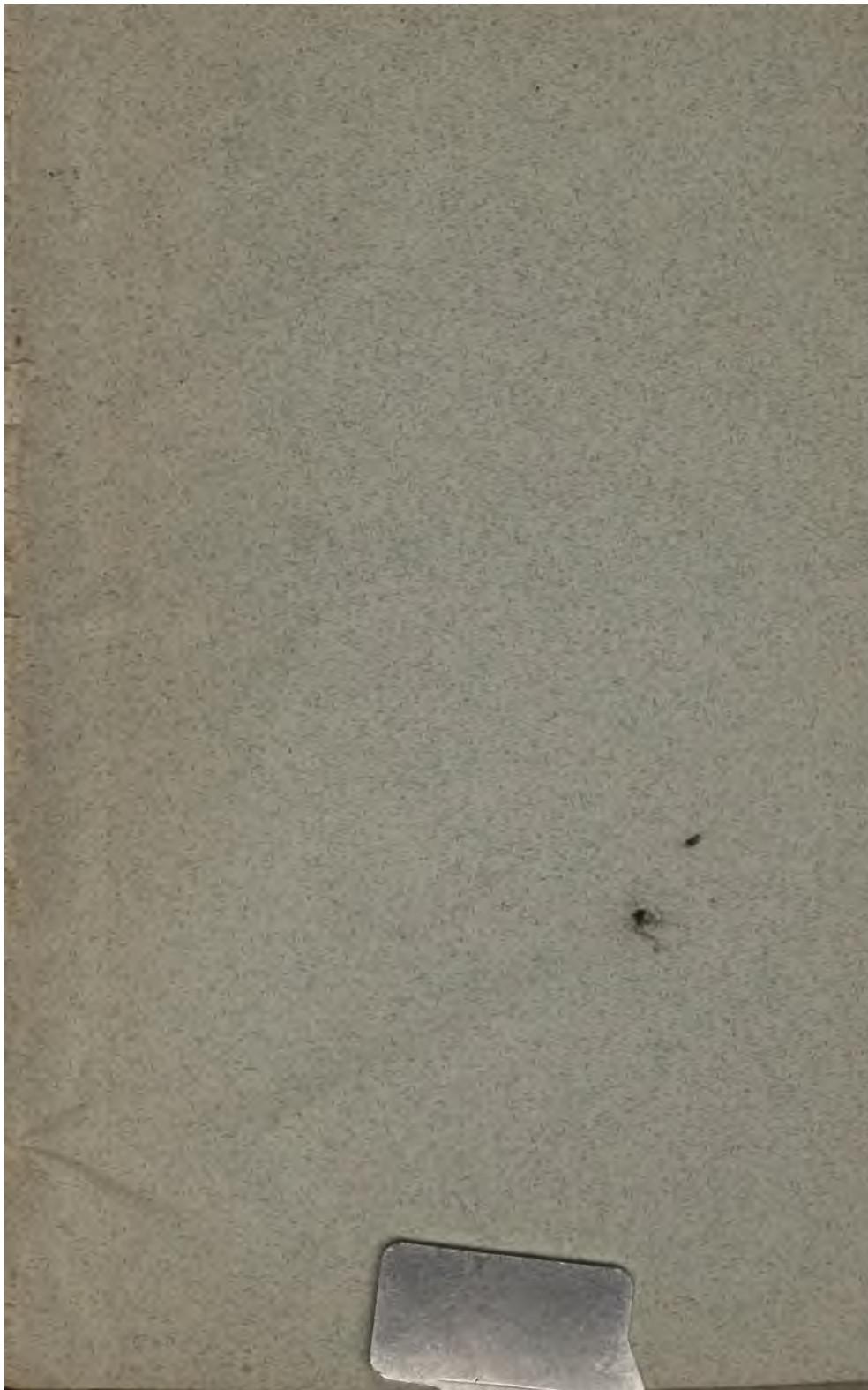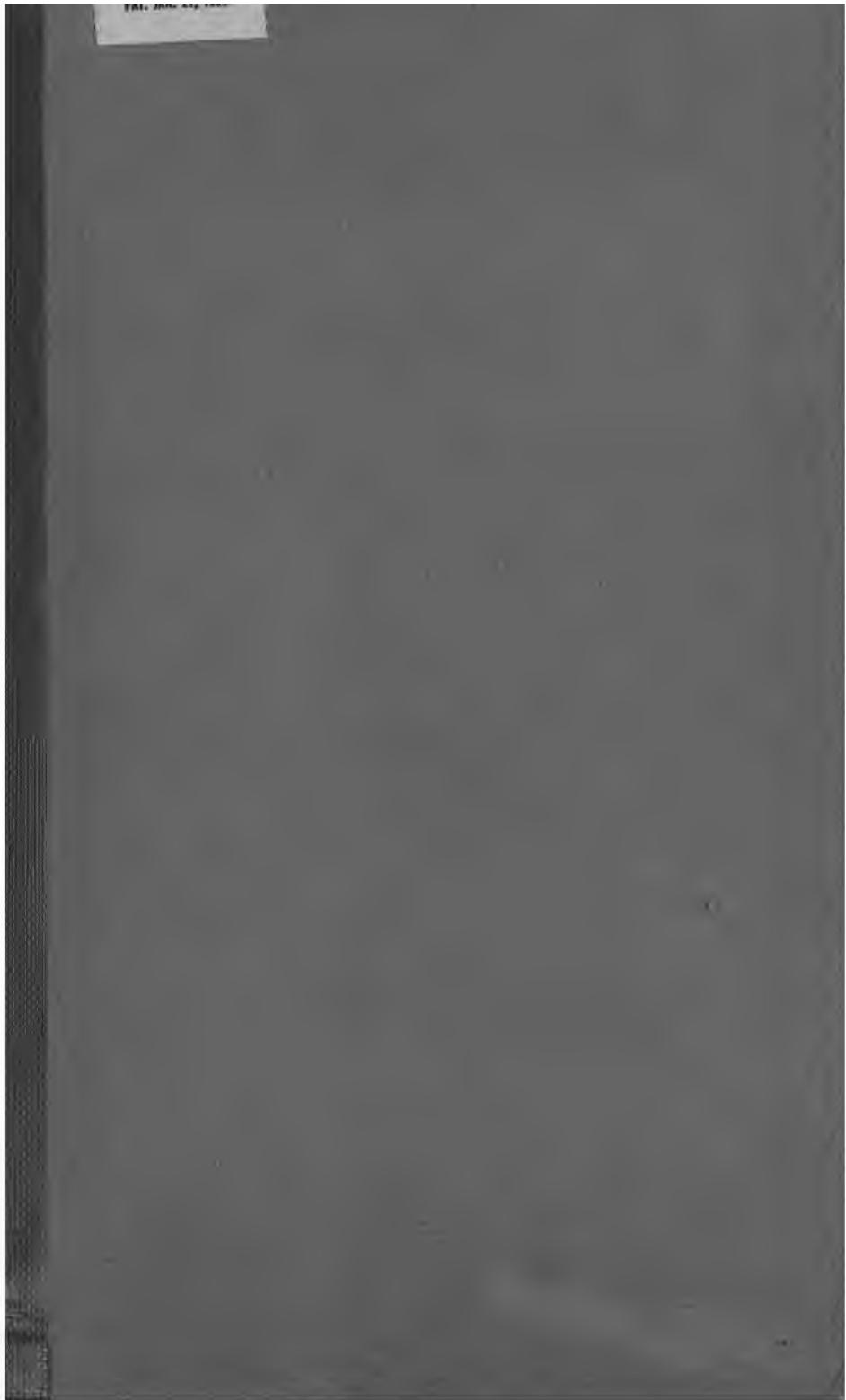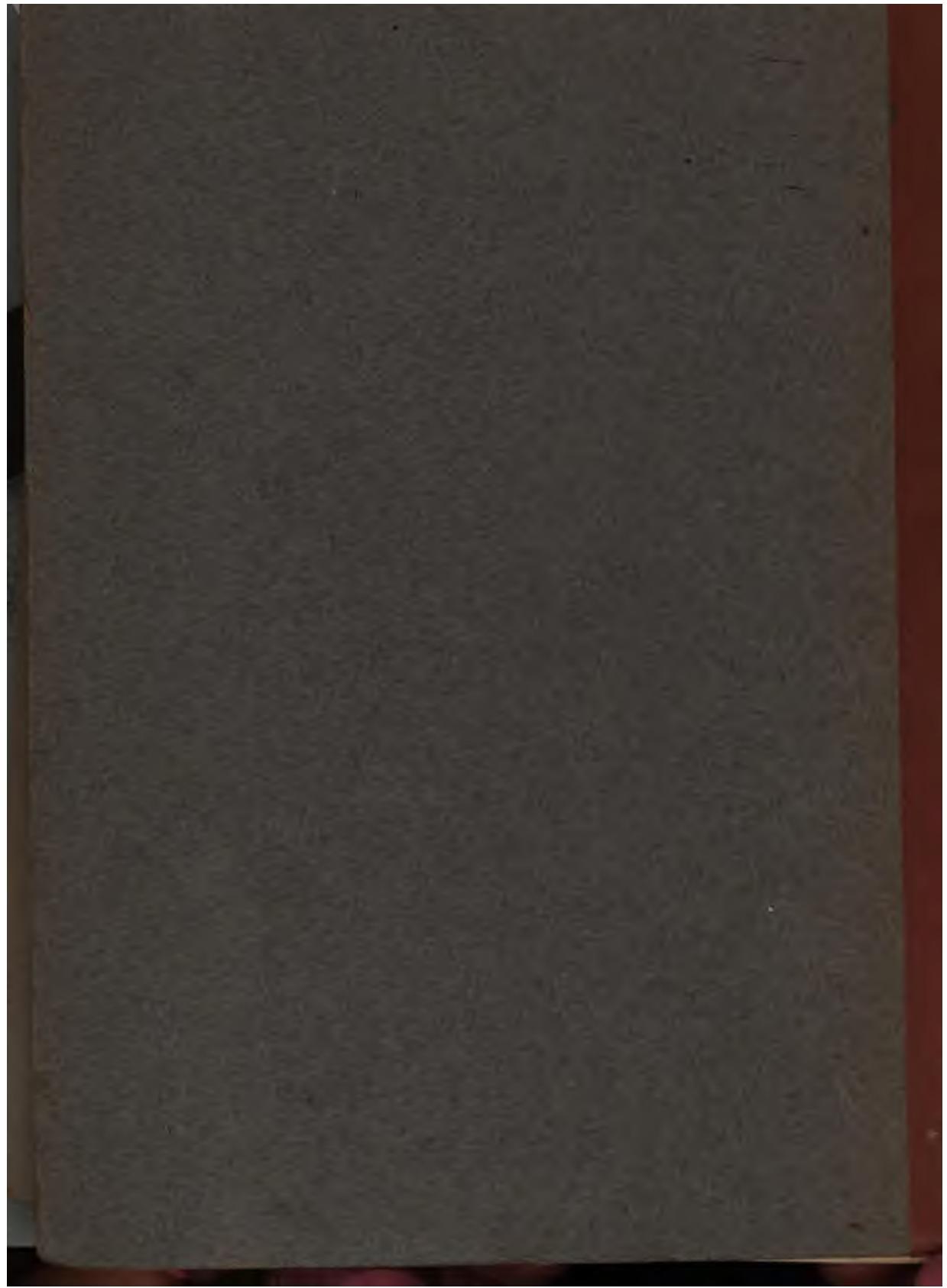
Die Diagnose der primären bosartigen
Geschwulste der Lungen.

I. Adler.

Die Diagnose der primären bösartigen Geschwülste der Lungen und Bronchien.

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"L'histoire clinique des tumeurs malignes du poumon est en-veloppées de bien des obscurités. Les descriptions classiques sont loin de répondre à la realité dans la majorité des faits."

So schrieben Spillman und Haushalter im Jahre 1891 (*Du diagnostic des tumeurs malignes du poumon.* Gazette hebdomadaire 1891, S. 573), und ihre Worte entsprechen im Grossen und Ganzen noch heute den Tatsachen, wenngleich zweifellos entschiedene Fortschritte in unseren diagnostischen Mitteln zu verzeichnen sind und auch seit jener Zeit unsere klinischen und pathologischen Kenntnisse bedeutende Erweiterungen erfahren haben.

Es ist zu beklagen, dass die primären bösartigen Geschwülste der Lunge und der Bronchien noch immer als seltene klinische Rarität betrachtet werden und daher fast ganz ausnahmslos dem praktischen Arzte gar nicht als diagnostische Möglichkeiten zum Bewusstsein kommen. Handelt es sich um dunkle oder zweifelhafte Fälle von Erkrankungen der Lunge, so wird gewöhnlich an Alles eher gedacht, als an Tumor und kann keine andere Diagnose gestellt werden, so muss meistens die so nahe liegende und immer bereite Tuberkulose herhalten. Gibt sich nun aber der Arzt nicht so leicht zufrieden, sucht er gewissenhaft das ungewöhnliche und verwirrende Krankheitsbild zu analysieren, so kann es leicht vorkommen, dass er in den geistigen Zustand verfällt, den Graves so lebhaft beschreibt. In seinen klinischen Vorträgen (Clinical Lectures on the Practice of Medicine. London, New Sydenham Society, 1884, 2nd Ed.) berichtet Graves über einen Fall bösartiger Lungengeschwulst, wahrscheinlich Sarcom. Er gibt eine detaillierte Analyse der klinischen Symptome und erläutert, wie sowohl er, als Stokes, in der Deutung des Falles irregeleitet wurden. Er bekennt ganz rückhaltslos, dass er die Diagnose schon wäh-

rend des Lebens hätte machen müssen und fügt in seiner charakteristischen Manier hinzu:

"I became quite tired of the difficulty of attempting to explain the phenomena observed, and gave up all further attempts at diagnosis."

Die primären bösartigen Lungengeschwülste sind nun tatsächlich nicht so selten, als gewöhnlich angenommen wird. Die alte Regel, nach welcher jene Organe, die am meisten von Metastasen heimgesucht werden, nur selten der Ursprungsort primärer Geschwülste sind. trifft, wenigstens bis zu einem gewissen Grade, auch für die Lunge zu. Aber man darf doch mit Bestimmtheit behaupten, dass das primäre Lungencarcinom häufiger vorkommt, als z. B. der primäre Leberkrebs. Die Statistik gibt uns bislang unbefriedigende und ungenügende Auskunft über diese Verhältnisse und das darf uns nicht Wunder nehmen, wenn man der besonderen Schwierigkeiten eingedenk ist, die hier auftreten. So hat Hansemann hervorgehoben, dass von 700 Krebsfällen, die zur Sektion kamen und von denen die grosse Mehrzahl während des Lebens unter der Beobachtung von den hervorragendsten Klinikern Berlins standen, 156 intra vitam nicht als Carcinom, ja nicht einmal als Tumor diagnostiziert waren. Von diesen waren 16 primär in der Lungen und Bronchien. (Riechelmann. Eine Krebsstatistik vom path. anat. Standpunkt. Berliner Klinische Wochenschrift 1902, 31 und 32.) Andrerseits waren 58 Fälle intra vitam als Krebs diagnostiziert und bei der Section nicht bestätigt worden. Diese Tatsachen aber, so beschämend sie auch für unsere diagnostische Zuverlässigkeit sein mögen, würden immerhin keinen so bedeutenden Einfluss auf die statistischen Ergebnisse haben, wenn nur jeder Fall überhaupt zur Autopsie käme. Aber leider muss zugestanden werden, dass besonders hierzulande die überwiegende Anzahl der Fälle gar nicht zur Section kommt und besonders in Bezug auf Lungengeschwulst gilt heute noch durchaus, was Boyd vor mehr als 20 Jahren schrieb. Er sagt:

"A case of malignant deposit in the bronchial glands infiltrating the lung, ending in ulceration and in the formation of cavities, is frequently set down as one of hopeless phthisis, a post-mortem of which would be of no interest, and all records of the frequency of the disease is in consequence entirely lost." (Cancer of Bronchial Glands and Lung. Transactions of the Academy of Medicine in Ireland, IV, 1886, S. 91.)

Eine weitere Schwierigkeit liegt nun noch darin, dass selbst bei der Section es nicht gar zu selten unmöglich ist, die richtige Diagnose

zu stellen. Es gibt Lungengeschwülste, die mikroskopisch durchaus nicht als solche imponieren, die in der anatomischen Diagnose als chronische, intertitielle oder fibröse Pneumosie aufgeführt werden und die nur nach sorgfältigster mikroskopischer Untersuchung, oft zum grossen Erstaunen des Pathologen, sich als echte Carcinome herausstellen.

Nichtsdestoweniger und trotz aller dieser Schwierigkeiten ist die Anzahl der Fälle von primären Lungengeschwülsten, welche von verschiedenen pathologisch-anatomischen Instituten berichtet werden, eine von Jahr zu Jahr zunehmende und das augenscheinlich nicht deshalb, weil etwa die Krankheit selbst im Zunehmen begriffen wäre, sondern nur, weil dem Gegenstande immer mehr Aufmerksamkeit geschenkt wird und ausführlichere und genauere Untersuchungen gemacht werden. Es ist kaum zu bezweifeln, dass in dem Masse, als der praktische Arzt mit dieser Krankheitsform mehr vertraut wird und unsere diagnostische Technik sich immer mehr entwickelt, auch die primären Lungengeschwülste immer häufiger zur Beobachtung gelangen werden.

Nach dem heutigen Stande unserer Kenntnisse kann man ganz allgemein sagen, dass primäres Carcinom der Lunge und Bronchien von 1 Prozent bis 5 Prozent aller Carcinomautopsien beträgt und 0.2 bis 0.6 Prozent aller Sectionen überhaupt. Primäres Lungensarcom ist ganz ungemein seltener und ist in den eben angegebenen Zahlen nicht mit einbegriffen. Ueberhaupt muss hervorgehoben werden, dass diese Zahlen approximative Durchschnittszahlen sind und nur auf den Statistiken einer Anzahl der grösseren deutschen pathalogisch-anatomischen Institute beruhen. In etwa den letzten 15 Jahren, seitdem meine Aufmerksamkeit mehr auf diese Krankheitsform gerichtet war, habe ich etwa 20 Fälle gesehen, eine Anzahl davon im Deutschen Hospital. Alle, mit Ausnahme eines einzigen, wurden intra vitam diagnostiziert und mit Ausnahme einiger weniger Fälle, bei denen keine Autopsie zu erhalten war, durch die Section post mortem bestätigt. Diese Zahlen weisen deutlich darauf hin, dass, obgleich man die primären bösartigen Lungengeschwülste unzweifelhaft zu den selteneren Krankheitsformen zu rechnen hat, das Vorkommen derselben doch nicht so rar ist, dass nicht jeder praktische Arzt ab und zu einen solchen Fall zu sehen bekommen kann und wahrscheinlich des Oefteren auch sieht.

Carcinom ist, wie gesagt, weitaus die häufigst vorkommende Geschwulstform der Lunge. Alle die verschiedenen Carcinomtypen,

das noch so viel umstrittene Endotheliom mit einberechnet, sind vertreten. Sarcom ist im Vergleiche zu Carcinom unverhältnismässig viel seltener. Ich selber habe keinen unzweifelhaften Fall von Sarcom der Lunge beobachtet.

Die grosse Mehrzahl aller Lungencarcinome sind Bronchialkrebse. Sie beginnen entweder in dem Hauptbronchus, — etwas häufiger vielleicht im rechten, — oder in dem einen oder anderen Bronchus zweiter Ordnung, selbst in Bronchien geringeren Kalibers. Die Geschwulst entwickelt sich an irgend einem Punkte der Mucosa oder Submucosa, wuchert frei in das Lumen des Bronchus, welcher auf diese Weise allmälig mehr oder weniger mit Geschwulstmasse gefüllt und unwegsam wird. Dabei wuchert die Geschwulst auch in entgegengesetzter Richtung, die Bronchialwand wird durchsetzt und zerstört, die Neubildung dringt in das peribronchiale Gewebe und breitet sich hier entlang der Bronchialverzweigungen aus. Auf diese Weise kommen mehr oder weniger ausgedehnte Infiltrationen der Lunge zu Stande, so dass oft genug der grösste Teil eines ganzen Lungenlappens von Geschwulstmasse erfüllt ist. In der Umgebung dieser primären Geschwulst können neue sekundäre Knoten auftreten, welche wieder zu grösseren Massen confluieren können.

Mittlerweile sind auch die Lymphdrüsen an der Lungenwurzel in den Prozess mit hereinbezogen. Allmälig füllt sich das Mediastinum; die grossen Gefässe, die Nerven, besonders der Vagus, die Trachea, der Oesophagus werden von Geschwulstmasse umgeben und auch durchwachsen und komprimiert. Durch das Pericard oder auch durch die grossen Gefässe dringt der Tumor bis an oder in das Herz. Der Verschluss von einem oder mehreren der grösseren Bronchien führt zu bronchiectatischen Erweiterungen, die mit reichlichem Bronchialsecret erfüllt, sehr leicht zu Abscessen Veranlassung geben. Die Geschwulst selbst neigt meistens sehr zu Zerfall, so dass in ihrem Innern unregelmässige Höhlen mit Detritus und auch oft mit eiterigem oder jauchigem Inhalte gefüllt, zu Stande kommen. Kompression oder Thrombose grösserer Aeste von Blutgefässen kann zu mehr oder weniger ausgebreiteter Gangraen führen. Mannigfache Infektion des Lungengewebes in der Umgebung der Geschwulst führt zu entzündlichen Infiltrationen.

Oft recht frühzeitig im Verlaufe der Erkrankung beteiligt sich die Pleura an dem Prozess. Es entstehen Adhäsionen, Exsudate, Schwarten. Durch die Pleura hindurch kann dann die Geschwulst in die

Brustwand übergehen; Rippen werden erodiert und zerstört, die Brustmuskeln mit Geschwulstmassen durchsetzt, so dass schliesslich der Tumor bis auf die Haut vordringen kann.

Dazu kommen dann noch die Metastasen. Im Allgemeinen kann man sagen, dass das Sarcom weniger Neigung zu Metastasenbildung hat als das Carcinom. Es ist auch von verschiedenen Seiten behauptet worden, dass der Lungenkrebs nur geringe Tendenz zur Metastasenbildung besitze, das ist aber in dieser allgemeinen Fassung nicht richtig. Es sind allerdings eine Anzahl Fälle von recht ausgedehntem Lungenkrebs berichtet, bei denen nicht eine einzige Metastase zu finden war, andere mit nur ganz wenigen, geringfügigen Metastasen. In einer sehr grossen Anzahl von Fällen aber, besonders wo es sich um Medullarkrebs handelte, treten zahlreiche Metastasen, manchmal in geradezu überwältigender Anzahl und in allen Teilen des Körpers auf. Die andere Lunge, Lymphdrüsen in allen Körperregionen, Knochen, Gehirn, Abdominalorgane — kurz, kein Organ oder Gewebe des Körpers, das nicht beteiligt sein kann. Ein grosses Fibroid des Uterus barg in seinem Innern einen Geschwulstknoten; die Nasenspitze, die Spitze eines kleinen Fingers mögen als seltene Lokalisationen sekundärer Geschwulstknoten angeführt werden. Schliesslich tritt der Exitus letalis in Folge allgemeinen Marasmus oder nach plötzlicher und profuser Lungenblutung, oder in Folge einer Metastase an irgend einer lebenswichtigen Stelle (e. g., Herz oder Gehirn) oder schliesslich durch Ersticken in Folge von Trachealkompression ein; dies letztere die qualvollste Todesart, die man sich denken kann.

Es ist aber nicht immer der Fall, dass das klinische Bild, wie es hier kurz skizziert ist, zu seiner vollen Ausbildung gelangt. Oft genug bringt der Tod Erlösung, ehe noch die Zerstörungen ihren weitesten Umfang erreicht haben. Auch ist nicht immer die Malignität des Krebses so gross und daher wird der Verlauf nicht so stürmisch und vielleicht auch nicht so destruktiv sich gestalten. Es ist daher leicht verständlich, dass mannigfache Uebergänge im anatomischen Bilde sowohl, wie im klinischen, zur Beobachtung kommen. Jene, im Ganzen seltenen Fälle, in welchen das Carcinom seinen Ursprung nicht von den Bronchien, sondern vom Alveolarepithel nimmt, gelangen überhaupt nicht zur grösseren Ausdehnung und sind fast stets bedeutend weniger bösartig als die Bronchialkrebse. Die Krankheit verläuft hier meistens unter dem Bilde einer chronischen Pneumonie und dies sind die Fälle, die intra vitam am seltensten diagnostiziert werden und

die auch bei der Section erst durch das mikroskopische Studium erkannt werden.

Was das Lungensarcom betrifft, so unterscheidet es sich in den klinischen Symptomen oft in keiner Weise von dem Carcinom der Lunge, namentlich in Bezug auf das Mitergriffensein des Mediastinums und der verschiedenen Organe des Lungenhilus. Manche Beobachter behaupten sogar, dass beim Lungensarcom die mediastinalen Lymphdrüsen sehr bald affiziert werden und sehr frühe im Verlauf der Erkrankung es zu recht massigen Mediastinalgeschwülsten komme und dass dies unter Umständen für die Differentialdiagnose zwischen Carcinom und Sarcom von Nutzen sein kann. Es kommt auch vor, dass das Sarcom enorm grosse, solide Geschwülste bildet, welche einen ganzen Lungenlappen, ja die ganze Lunge einnehmen und die betreffende Pleurahöhle vollkommen auszufüllen vermögen. Derartige Geschwulstmassen kommen bei Carcinom nie vor.

Diese kurze, nur in den allgemeinsten Umrissen gezeichnete Skizze mag genügen, um zu zeigen, wie verwickelt und kompliziert die klinischen Erscheinungen sein können und welche diagnostischen Schwierigkeiten man zu gewärtigen hat. Denn es ist ja klar, dass die subjektiven Symptome sowohl, als auch die objektiven Zeichen, innerhalb sehr weiten Grenzen variieren müssen, je nach der Bösartigkeit, dem Sitz und der Ausdehnung der Primärgeschwulst, dem Umfang der Zerstörungen und der Lokalisation der sekundären Herde. Es sind allerdings Fälle bekannt, welche anscheinend ganz symptomlos auftreten. Die Patienten gehen ihrem Lebensberufe in gewöhnlicher Weise, ohne irgend welche Klagen, nach. Nichts weist auf eine Erkrankung, namentlich nichts auf eine Lungenerkrankung hin. Da treten ganz plötzlich und ohne irgendwelche Warnung, schwere, meistens stürmische und bald letal endigende Erscheinungen auf. Einmal sind es profuse Lungenblutungen, ein anderes Mal Symptome von Seiten des Gehirns, des Rückenmarks, der Leber, des Herzens, der Knochen u. s. w., u. s. w., Erscheinungen, die auf metastatischen Bildungen beruhen, ohne dass die primäre Geschwulst klinisch nachweisbare Störungen verursacht hätte: Dies sind aber immerhin Ausnahmsfälle. In den weitaus meisten Fällen mangelt es nicht an frühzeitigen Symptomen, die allerdings oft recht geringfügig sein mögen, aber, wenn richtig gedeutet, diagnostisch wertvoll sind.

Brustschmerz ist eines der häufigsten und auch eines der frühzeitigsten Symptome. Nach Schmidt (Die Schmerzphänomene bei inneren

Krankheiten, Wien 1906) besitzt das Lungengewebe keine Schmerzempfindsamkeit und wird eigentlicher, akuter Schmerz bei Lungenerkrankungen erst dann wahrgenommen, wenn die Pleura in Mitleidenschaft gezogen ist. Daher ist auch das Schmerzgefühl in den frühesten Entwicklungsstadien der Lungengeschwulst kein heftiges, qualvolles, sondern es besteht mehr in einem dumpfen, unbestimmten, schwer zu lokalisierendem Gefühl des Druckes und Unbehagens, das immerhin die Patienten als Schmerz bezeichnen. Mit der weiteren Beteiligung der Pleura, mit dem Auftreten entzündlicher Prozesse und Ergüssen kann aber der Schmerz dann sehr intensiv und anhaltend werden. In Uebereinstimmung mit den bekannten Beziehungen der Pleura zum Plexus brachialis, den Intercostalnerven und dem Zwerchfell finden sich dann schmerzhafte Ausstrahlungen in der Schulter und dem Arm der affizierten Seite, den Intercostalnerven, dem Rippenrand und dem Abdomen.

Ein weiteres, überaus häufiges und oft sehr frühzeitiges Zeichen ist die Kurzatmigkeit bei der geringsten Anstrengung und ist dieses Symptom, wenn Herzkrankheiten ausgeschlossen werden können, von grosser diagnostischer Wichtigkeit. Die höheren Grade der Dyspnoe gehören den späteren Stadien der Erkrankung an und werden verursacht, nicht durch Bronchialverstopfung, wie das oft irrtümlich angegeben wird, sondern durch Kompression oder Verstopfung der Trachea. Es gibt wohl in der ganzen Scala menschlichen Leidens, welchem wir Aerzte entgegenzutreten und zu bekämpfen haben, nichts so Qualvolles und dabei so Hoffnungsloses, als die äussersten Grade von Orthopnoe und Erstickung, wie sie bei substernaler Trachealkompression in den letzten Stadien von Lungen- und Mediastinalgeschwülsten vorkommen.

Husten mag sehr frühzeitig im Verlauf der Krankheit auftreten, oder mag anderseits erst ganz spät in Erscheinung treten, wird wohl aber im Allgemeinen kaum gänzlich während des vollen Verlaufs der Krankheit fehlen. Sehr oft ist ein kurzer, trockener, andauernder Husten, mit nur wenig oder gar keinem Auswurf, das allererste Zeichen und mag auftreten, ehe die sorgfältigste Untersuchung der Brust irgend eine Erkrankung nachweisen kann. Es ist aber manchmal doch möglich, bei sehr genauer Auskultation an einer kleinen Stelle am Rücken. entweder rechts oder links an der Wirbelsäule und dicht an derselben, in der Gegend, welche etwa dem Lungenhilus entspricht, ein eigentümliches Bronchialgeräusch, von den Franzosen "Cornage" genannt, wahrzunehmen, das mit Bestimmtheit auf eine Verengerung

eines gröseren Bronchus hinweist. Dieser Befund ist bei einem
älteren Individuum, in sonst guter Gesundheit und ohne auffällige
Zeichen einer Lungenerkrankung, besonders wenn auch der eben be-
sprochene kurze Husten vorhanden ist, von schwerwiegender diagnos-
tischer Bedeutung und sollte ohne Weiteres Verdacht auf ein mög-
liches Lungencarcinom erregen.

Wie bei allen anderen Formen maligner Geschwülste, so sind auch
hier Gewichts- und Kräfteverlust sehr unzuverlässige und inkonstante
Zeichen. In vielen Fällen von Lungengeschwulst wird Cachexie schon
in sehr frühzeitigem Stadium der Erkrankung beobachtet, mag unter
Umständen das allererste, verdächtige Zeichen sein. In anderen
Fällen dagegen tritt Cachexie erst sehr spät, gar nicht oder kaum be-
merkbar auf. Ich habe eine Reihe von Fällen gesehen, in welchen
eine bemerkenswerte Abnahme von Gewicht oder von Kräften bis zum
Exitus nicht zu beobachten war.

Von grösstem Interesse und Wichtigkeit ist der Auswurf. Das
vielbesprochene, sogenannte himbeergelée-artige Sputum wird heute
noch in den meisten Lehrbüchern als geradezu pathognomonisch für
bösartige Lungentumoren angeführt. Das ist aber entschieden nicht
richtig. Dieses Sputum ist nicht nur bei anderen Erkrankungen der
Lunge gelegentlich zu beobachten, es sind auch eine stattliche Anzahl
von Lungengeschwülsten bekannt, bei denen das himbeergeléefarbige
Sputum nie beobachtet wurde. Man wird also sagen dürfen, dass, wo
andere Zeichen auf eine Lungengeschwulst hinweisen, das Vorkom-
men dieser Art des Auswurfes eine weitere diagnostische Bestätigung
darstellt. Das Fehlen desselben dagegen hat nicht den geringsten
diagnostischen Wert. Es gibt Fälle, wo überhaupt vom Anfang bis
zum Ende kein Auswurf vorhanden ist. In vielen anderen handelt es
sich blos um ein schleimiges, in keiner Weise charakteristisches Spu-
tum. Wo Bronchietasien vorhanden sind, mag der Auswurf schleimig-
eitrig, eitrig oder jauchig sein. Ist es zu Gangraenen gekommen, so
wird der Auswurf die charakteristischen Bestandteile bieten. In der
grossen Mehrzahl der Fälle handelt es sich um mehr oder we-
niger konstante blutige Expektorationen. Manchmal ist dieser
blutige Auswurf so geringfügig und so transitorisch, dass nur durch
die allergenaueste Nachforschung die Tatsache zu eruieren ist,
dass dergleichen überhaupt vorgekommen. Andrerseits kann es vor-
kommen, dass sanguinolente Expektoration während des ganzen Ver-
laufes der Erkrankung konstant vorhanden ist. Gelegentlich handelt

es sich blos um eine, hie und da auftretende, leichte Rosafärbung des Sputums. Häufiger ist eine dunkelrote oder schwarzrote zähe Expektoration. Profuse Hämorrhagien kommen auch vor und sind durchaus nicht so selten, wie manche Autoren, z. B. Hampeln, meinen. Es kann vorkommen, dass, wie dies so oft bei Tuberkulose zu beobachten ist, eine plötzliche starke Lungenblutung das allererste Anzeichen abgibt, dass ein Lungenleiden vorliegt. Diese Lungenblutungen können in jedem Stadium der Erkrankung auftreten und führen nicht selten den plötzlichen Tod des Kranken herbei. Einer meiner Fälle, ein Mann, der allen Anzeichen nach noch weit von dem letalen Ende entfernt war, starb plötzlich an profuser Lungenblutung in einem Wagen auf dem Wege zu einer wissenschaftlichen Versammlung, bei der ich den Fall demonstrieren wollte.

In einigen Fällen von Sarcom wurde ein eigentümliches, grasgrünes Sputum beobachtet. Dieses Sputum enthält mikroskopisch nichts Charakteristisches und kann auch nicht als phatognomonisch bezeichnet werden. Dagegen mag es in Verbindung mit anderen Symptomen die Diagnose auf Sarcom bestärken und zur Unterscheidung zwischen Sarcom und Carcinom verwendet werden. Es liegt auf der Hand, dass die systematische und sorgfältigste bakteriologische und histologische Untersuchung des Auswurfes von grösster Wichtigkeit sein muss. Wo deutliche Zeichen von Infiltration und Höhlenbildung sich auf der Lunge finden, wo es sich um Lungenblutungen oder um sanguinolentes Sputum handelt und dabei Tuberkelbaccillen im Auswurf konstant fehlen, da sollte immer an die Möglichkeit, ja Wahrscheinlichkeit von Lungenkrebs gedacht werden. Aber selbst der Befund von Tuberkelbaccillen im Sputum schliesst die Möglichkeit maligner Lungengeschwulst nicht aus, denn die Kombination von Tuberkulose und Carcinom in der Lunge ist keineswegs selten und es kann auch hier zuweilen gelingen, durch sorgfältiges mikroskopisches Studium des Sputums die richtige Diagnose festzustellen. In einigen wenigen, vereinzelten Fällen — es handelte sich wahrscheinlich immer um Sarcom — sind ziemlich massige Stücke direkt ausgespuckt worden. Hie und da konnten im Sputum auch kleine Krebspartikel durch das Mikroskop erkannt werden. Dies sind aber ganz exzeptionelle Vorkommnisse. In der überwiegenden Majorität der Fälle konnte die konstante, selbst tägliche, und gewissenhafteste mikroskopische Untersuchung der Sputa, durch viele Monate fortgesetzt, keine echte Carcinompartikel nachweisen. Man machte sich daher auf die Suche

nach charakteristischen Zellen. Nun kommen aber regelmässig im Auswurf eine Menge epithelialer Zellen aller Art vor, so dass a priori der Versuch ganz hoffnungslos erscheinen möchte, aus den Platten-epithelien, gross oder klein, rund oder polygonal, den Cylinderzellen mit oder ohne Cilien, Krebszellen herauszufinden. Nichtsdestoweniger hat man die Aufmerksamkeit auf gewisse Zellenformen gelenkt, deren Auftreten im Sputum als durchaus pathognomonisch aufzufassen sei, so dass durch das Auffinden dieser Zellen die Diagnose von Lungen-krebs sichergestellt wäre. Hampeln (Ueber den Auswurf beim Lungencarcinom. Zeitschrift für klinische Medicin. Band 32, 1897, S. 246) berichtet über das Vorkommen im Auswurf von gewissen grossen, polygonalen und polymorphen Zellen, welche er charakteristisch für Carcinom hält. Dieselben sollen oft in grösseren Mengen erscheinen, können die verschiedensten Formen annehmen, namentlich kolben- und keulenförmige, riesenzellenartige Bildungen darstellen, aber verlieren nie ihren epitheloiden Charakter. Während nun alle gewöhnliche Formen von Epithelzellen, welche im Sputum vorkommen, stets mehr oder weniger pigmentiert sind, sind diese von Hampeln beschriebenen Zellen, — und das ist das wichtigste Characteristicum, — stets durchaus pigmentfrei. Diese Gebilde treten, nach Hampeln, nicht konstant im Sputum auf. Man mag lange Zeit vergeblich nach ihnen suchen. Findet man dieselben aber, und wenn auch nur ein einziges Mal, so ist nach Hampeln die Diagnose sicher, denn diese Gebilde sollen nur bei Carcinom und unter keinen anderen Bedingungen vorkommen.

Einer anderen Art von Zellen wird von Lenhartz (Ebstein und Schwalbe. Handbuch der praktischen Medizin, 1899) eine grosse Bedeutung zugeschrieben. Es sind dies grosse runde Zellen, mit recht prominenten Fettgranula gefüllt, die von Lenhartz sogenannten "Fettkörnchenkugeln." Sie sollen von degenerierten Krebszellen her-stammen, treten oft in bedeutenden Mengen im Sputum auf, mögen aber ein anderes Mal nur sehr spärlich vorhanden sein, öfters auch zeitweilig fehlen. Doch sollen sie in jedem echten Falle von Carcinom nachweisbar sein und sollen nur bei Carcinom vorkommen. Man muss sich versichern, nur solche Sputa zur Untersuchung zu benützen, bei welchen jede Möglichkeit einer Verunreinigung mit Milch ausge-schlossen ist. Bei Beobachtung dieser Cautelen aber soll der Nach-weis dieser Fettkörnchenkugeln im Auswurf die Diagnose auf Lungen-krebs sichern. Seitdem diese Lenhartz'schen Befunde uns bekannt

wurden, hatten wir Gelegenheit, nur einen Fall von Lungencarcinom zu beobachten, in dessen Sputum aber diese Fettkörnchenkugeln in grosser Menge und in schönster Weise zu demonstrieren waren. Wir haben ausserdem eine beträchtliche Menge von Sputa bei den verschiedensten Lungenerkrankungen untersucht, ohne je diese charakteristischen Zellen nachweisen zu können. Es erscheint demnach als durchaus nicht unwahrscheinlich, dass diese Zellen wirklich pathognomonisch für Lungenkrebs sind, und ein weiteres, genaues Studium dieser Frage wäre sehr erwünscht.

Was nun die physikalischen Zeichen betrifft, so mögen dieselben unter Umständen ganz einfach und geringfügig sein, anderen Falls wieder ausserordentlich kompliziert und verwirrend. Ueberblickt man eine grosse Reihe von Fällen, wie sie in der Literatur vorliegen (ich habe zwischen vier- und fünfhundert Fälle zusammengestellt), so macht sich aber doch eine gewisse Einförmigkeit der Erscheinungen bemerkbar, so dass es angebracht erscheint, die klinischen Bilder in gewisse, mehr oder weniger typische Gruppen einzureihen. Am Bequemsten wird zu diesem Zwecke die von Marfan vorgeschlagene Klassifikation sein:

1. *Cancer pleuro-pulmonaire aigu ou galopant.* Diese galoppierende Form charakterisiert sich durch äussert rapiden Verlauf, heftigen Husten, starker Dypsnoe, rascher Abmagerung, Asphyxie, Tod nach einigen Monaten oder noch früher. Man glaubt eine akute Miliartuberkulose vor sich zu haben. Bei der Section finden sich meistens beide Lungen und Pleurae mit Krebsknoten besäet. (Akute Miliare Carcinose.) Bei dieser Form brauchen wir uns nicht aufzuhalten. Dieselbe ist nicht nur ganz ausserordentlich selten (in der ganzen Literatur sind nur einige wenige, zerstreute Fälle berichtet), sondern es bestehen auch begründete Zweifel, ob es sich hier um primäre Affektion der Lunge handelt. Aber gesetzt auch, dass wirklich gelegentlich einmal ein derartiger Fall primär in der Lunge auftritt, so erscheint es kaum wahrscheinlich, dass die Diagnose intra vitam gestellt werden kann.

2. *Cancer pleuro-pulmonaire chronique.* Dieses ist die gewöhnliche, chronische Form des Lungenkrebses, welche aber wieder in mehrere untergeordnete Gruppen eingeteilt werden kann. Es darf aber nicht vergessen werden, dass diese Einteilungen nur den Zweck bequemer klinischer Handhabung haben und durchaus nicht streng und scharf von einander getrennten Krankheitstypen entsprechen. Je

nach der Ausbreitung und Entwicklung der Geschwulst werden die klinischen Bilder oft wechseln und in einander übergehen, und es kommt oft genug vor, dass mehrere, ja alle der hier angedeuteten Typen in Verlauf eines einzigen Falles zur Beobachtung kommen.

a) *Cancer broncho-pulmonaire, type classique du cancer du poumon.* Dieses ist der gewöhnliche, typische Bronchialkrebs, die allerhäufigste Form des sogenannten primären Lungenkrebses. Das klinische Bild wird hier beherrscht von Symptomen, welche hauptsächlich auf Lunge und Bronchien zu beziehen sind. Die allerfrühesten Stadien scheinen meistens unter dem Bilde einer einfachen chronischen Bronchitis aufzutreten. Aber selbst in dieser Frühperiode der Erkrankung wird es oft genug möglich sein, hinter den anscheinend sehr geringfügigen Erscheinungen, der Entwicklung eines schweren Leidens, eines Tumors, auf die Spur zu kommen. Der gelegentliche blutige Auswurf, die Kurzatmigkeit bei geringen Anstrengungen, die allgemeine Schwäche, in gar keinem Verhältnis zur Geringfügigkeit der nachweisbaren Symptome, können oft schon sehr frühzeitig gegründeten Verdacht auf beginnende Entwicklung einer bösartigen Lungengeschwulst erregen. Einer sehr sorgfältigen Untersuchung der Brust gelingt es auch nicht selten, schon sehr früh im Verlauf der Krankheit einen kleinen Dämpfungsbezirk festzustellen, meistens am Rücken, in der Nähe der Wirbelsäule, dem Hilus der einen oder anderen Lunge entsprechend, vielleicht auch über einer Lungenspitze. Diese Dämpfung hat vielleicht die Neigung, sich langsam auszudehnen und im Bereiche dieser Dämpfung sind Atmung und Stimmfremitus abgeschwächt. In späteren Entwicklungsstadien wird nun die Sache meist komplizierter. Wenn ausgedehnte, schwere Dämpfungen zu Stande gekommen sind, wenn durch Zerfall der Geschwulst oder durch bronchiektatische Dilatationen Höhlenbildungen zu Stande gekommen sind, mit amphorischem Atmen, klingenden Rasselgeräuschen, tympanitischem Perkussionsschall, wenn Fieber, Nachtschweiss, Lungenblutungen auftreten, da kann es nicht Wunder nehmen, dass so oft diese Fälle als Tuberkulose und Phthise aufgefasst werden und diese Diagnose festgehalten wird, bis das Auftreten deutlich nachweisbarer Metastasen oder die Section den Irrtum aufklären. Kommt ein Fall so spät und mit den eben angedeuteten Erscheinungen zur Beobachtung, so ist selbstverständlich die Diagnose recht schwierig und kann wohl auch kaum bei der ersten Untersuchung gemacht werden. Aber die richtige Auffassung ist auch hier immerhin vielfach möglich, na-

mentlich wenn es sich um unkomplizierte Fälle handelt und wenn man auch oft die Diagnose nicht mit absoluter Sicherheit stellen kann, so kann man doch einen recht hohen Grad der Wahrscheinlichkeit dafür in Anspruch nehmen. Ist der Sitz der Krankheit vorwiegend im unteren Lappen, so ist die differentiale Diagnose im Ganzen doch leichter. Die Lungenspitze, der Lieblingssitz des phthisischen Prozesses, ist hier meistens frei oder nur ganz geringfügig beteiligt. Die Dämpfung ist meistens ganz unregelmässig in Ausdehnung und lokalisiert entweder über der vorderen Brustwand oder, was viel häufiger der Fall ist, am Rücken, von der Gegend des Lungenhilus aus sich verbreitend und auch dort am Intensivsten. Diagnostisch besonders wichtig ist noch die Tatsache, dass über dieser Dämpfung in Folge der Obstruktion der Bronchien durch die Geschwulst, Atmung und Stimmfremitus bedeutend abgeschwächt sind oder auch ganz fehlen. Dies kommt nie bei phthisischer oder pneumonischer Infiltration vor. Bronchialatmen, vermehrter Stimmfremitus treten nur dann auf, wenn entzündliche Verdichtungen in der Umgebung der Neubildung zu Stande gekommen sind.

Ein weiteres, sehr bezeichnendes Characteristicum findet sich in einer gewissen Unbeständigkeit der physikalischen Zeichen, wie sie wohl bei keinem anderen Prozesse vorkommt. Es liegt z. B. eine ausgedehnte, schwere Dämpfung vor, über welcher Stimme und Atmung kaum oder gar nicht zu hören sind. Da tritt ganz plötzlich ganz lautes Bronchialatmen und stark vermehrter Stimmfremitus auf. Der zuführende Bronchus nämlich, der bisher durch Geschwulstmasse vollständig verlegt war, wird plötzlich durch Zerfall der Geschwulst wieder durchgängig. Nach einiger Zeit kann sich durch erneuerte Proliferation der Neubildung der Bronchus wieder verstopfen und die früheren Verhältnisse treten wieder auf. Eine bronchiektatische Höhle mit Schleim, Eiter, Detritus erfüllt, macht sich vielleicht, da auch der zuführende Bronchus verstopft ist, nur durch etwas Dämpfung bemerkbar. Nun werden auf die eine oder die andere Weise die Bronchien wieder durchgängig und ganz plötzlich, innerhalb weniger Stunden oft, sind alle Zeichen einer grösseren oder kleineren Höhle vorhanden. Diese so überraschenden und plötzlich auftretenden Wechselbilder kommen bei keiner anderen Form von Lungenerkrankung vor. Weiter spricht gegen Tuberkulose das konstante Fehlen der Tuberkelbacillen im Sputum, während die Lenhartz'schen Fettkörnchenkugeln, im Falle sie gefunden werden, für Carcinom

sprechen. Bei Tuberkulose tritt meistens schon recht frühzeitig Fieber auf und ist immer vorhanden, wenn Ulcerationen oder Cavernenbildung vorliegen. Der Lungenkrebs kann unter Umständen von Anfang bis zum Ende ohne eine Spur von Temperaturerhöhung verlaufen. Tritt Fieber auf, so ist es meistens sehr spät im Verlaufe der Krankheit, ganz unregelmässig in der Kurve und gar nicht ähnlich dem hektischen Typus bei Phthise. Die Tatsache ferner, dass alle diese mannigfachen Prozesse, die Infiltration, die Höhlenbildung u. s. w. meistens nur auf eine Lunge, ja oft nur auf einen Teil einer Lunge beschränkt sind, mag auch zur Unterscheidung von Tuberkulose dienen. Die neueren Reaktionen auf Tuberkulose, die Ophthalmoreaktion von Wolff-Eisner oder die cutane Reaktion von Pirquet, mögen unter Umständen von grossem Wert sein und sollten sicherlich in jedem zweifelhaften Falle angewendet werden. Da aber diese Reaktionen nur anzeigen, dass irgendwo im Körper ein tuberkulöser Prozess vor sich geht und nicht notwendigerweise in der Lunge, so würde der positive Ausfall der Reaktion in diesen zweifelhaften Fällen noch nicht mit Sicherheit Tumor ausschliessen, während der negative Ausfall der Reaktion die Wahrscheinlichkeit, dass es sich um Tumor handelt, bedeutend erhöhen würde.

Ein weiteres und oft sehr hilfreiches diagnostisches Mittel ist durch die Roentgenstrahlen gegeben. Ein Bronchialkrebs vom Lungenhilus ausgehend und von da in den unteren oder mittleren Lappen vordringend, liefert ein ganz charakteristisches Bild auf dem Schirm oder der photographischen Platte, ein Bild, das durchaus verschieden ist von dem, was man bei Lungentuberkulose oder einer anderen Lungenkrankheit zu sehen bekommt. Es kann sogar unter günstigen Bedingungen möglich werden, einen Lungenkrebs zu erkennen, der sich im Innern der Lunge entwickelt, noch verhältnismässig klein ist, von gesundem Lungengewebe umgeben und kaum noch klinische Symptome verursacht. Um dies aber zu ermöglichen, muss der Arzt den Lungentumoren gegenüber eine ganz andere Stellung einnehmen, als dies bisher geschehen ist. Kein gewissenhafter Arzt untersucht heutzutage eine Brust, ohne an die Möglichkeit der Tuberkulose zu denken. Es ist nicht zu viel gesagt, dass kaum ein Einziger je an die Möglichkeit einer Neubildung denkt. Wenn überhaupt ein Fortschritt in der Diagnose und Behandlung dieser Unglücklichen erzielt werden soll, ist es durchaus notwendig, dass man sich gewöhnt, besonders bei älteren Personen, an die Möglichkeit von Bronchial- und Lungenkrebs

zu denken, mit derselben Aufmerksamkeit oder vielleicht mit noch grösserer Aufmerksamkeit, als man bisher der Tuberkulose zugewendet hat.

Der Krebs, der in dem oberen Lappen seinen Ursprung nimmt, bietet vielleicht bei oberflächlicher Betrachtung mehr Aehnlichkeit mit Tuberkulose und kann leicht mit derselben verwechselt werden. Die Differentialdiagnose aber sollte bei aufmerksamer Beobachtung keine allzu grossen Schwierigkeiten bieten, so lange der Fall ein unkomplizierter ist. Nun kommt es aber nicht allzu selten vor, dass Lungentuberkulose und Lungenkrebs bei einem und demselben Individuum gleichzeitig auftreten, dass die Sputa von Tuberkelbaccillen wimmeln und dass alle anderen typischen Anzeichen von Phthise vorhanden sind. In solchen Fällen wird es wahrscheinlich nur bei äusserst seltenen Konjunkturen günstiger Verhältnisse möglich sein, das Carcinom zu diagnostizieren. Ein kleiner Krebs, von der Wand einer tuberkulosen Kaverne ausgehend, wie Friedländer und Andere dergleichen beobachtet haben, mag möglicherweise vielleicht durch den Nachweis von Fettkörnchenkugeln im Sputum geahnt werden, wird aber wohl kaum mit Sicherheit zu diagnostizieren sein. In einigen wenigen, günstig gelegenen Fällen von Tuberkulose und Krebs ist allerdings die Diagnose während des Lebens gestellt und durch die Section bestätigt worden. Vielleicht wird auch der neuerliche Aufschwung der Bronchoskopie zur Erkenntnis dieser Fälle beitragen können. Schon sind einige Fälle berichtet, in welchen ein Bronchialkrebs durch das Bronchoskop direkt sichtbar gemacht und so die Diagnose über allen Zweifel sichergestellt wurde.

b) Form du tumeur de mediastin. Dem Bronchialkrebs, gleichgültig ob der betreffende Bronchus gross oder klein ist, stehen hauptsächlich zwei präformierte Bahnen zur Ausbreitung zur Verfügung. Die leichteste und natürlichste und diejenige, welche in weitaus der grösseren Majorität der Fälle zunächst benützt wird, ist entlang der bronchialen Verzweigungen und des peribronchialen Gewebes in's Innere der Lunge. Erst in den späteren Stadien, nachdem der Bronchus ausgiebig zerstört, beteiligen sich die bronchialen und mediastinalen Lymphdrüsen, welche dann zuweilen ganz enorme Massen darstellen. Das Mediastinum, das vordere wie das hintere, wird dann mit Geschwulstmasse erfüllt, das Pericardium davon bedeckt und auch durchbrochen, die grossen Blutgefässe, Aorta und Venae cavae, die Lungenarterien und Venen von Geschwulst umgeben und komprimiert, die

oberflächlichen Venen der Brust und des Halses erweitert, der Nervus recurrens von Geschwulst zerdrückt, Trachea, Hauptbronchien, Oesophagus komprimiert, so dass schliesslich alle Zeichen einer grossen Mediastinalgeschwulst zu beobachten sind. Das Sarcom, das von dem Hilus einer Lunge ausgeht, unterscheidet sich von dem Hiluskrebs insofern, als die Tendenz der Geschwulst von Anfang an weniger in's Innere der Lunge und mehr und schneller gegen das Mediastinum zu gerichtet ist. In einem Falle, der erst in diesem Stadium zur Beobachtung kommt, ist die Differentialdiagnose ob primärer Lungentumor, ob primäre Mediastinalgeschwulst, oder auch ob Aneurysma, immer sehr schwierig und leider oft ganz unmöglich. Es würde zu weit führen, auf alle diese Punkte einzugehen, die möglicher Weise differentialdiagnostisch in Betracht kommen können. Nur einige wenige sollen kurz hier angedeutet werden. Zunächst sei bemerkt, dass es vielleicht noch eher gelingen wird, das Lungencarcinom zu diagnostizitren, als das Lungensarcom.

Namentlich ein genaues Studium der Anamnese kann oft klarstellen, dass, lange ehe die Mediastinalerscheinungen auftraten, die Lunge schon primär erkrankt war. In den meisten Fällen von primärer Mediastinalgeschwulst ist es fast Regel, dass gar keine klinischen Symptome zu beobachten sind, bis die Geschwulst eine gewisse Grösse erreicht hat und dass dann, mit einem Male, die Erscheinungen des intrathorazischen Druckes auftreten. Bei dem Lungenkrebs andrerseits ist meistens die oben skizzierte Reihenfolge der Erscheinungen zu konstatieren. Die natürlich präformierte Route für die weitere Ausdehnung der Mediastinalgeschwulst liegt entlang des Verlaufes der grossen Gefässe und demnach mehr nach links zu. Demzufolge wird es immer leichter sein, eine primäre Geschwulst der rechten Lunge als solche zu diagnostizieren, während eine Geschwulst der linken Lunge in dieser Beziehung grössere Schwierigkeiten bereitet. Oedöm der rechten Seite des Gesichtes, der rechten Schulter, des rechten Armes und der rechten Brust, Lähmung des rechten Rekurrenz, weisen auf Lungengeschwulst hin. Auswachsende Geschwulst in das Jugulum hinein deutet auf Mediastinalgeschwulst. Besteht ein Erguss in die Pleura, so ist derselbe meistens bei Lungentumor auf die affizierte Seite beschränkt. Erguss in beide Pleurahöhlen kommt häufiger bei Mediastinaltumor vor. Jacobson (Primäre Lungen- und Mediastinaltumoren, Festschrift für Lazarus, Berlin, 1899) weist darauf hin, dass bei Mediastinaltumoren eine grössere respiratorische Ver-

schiebbarkeit der Lungen vorhanden ist, während bei Lungenge-
schwulst die Verschiebbarkeit der affizierten Lunge bedeutend behin-
dert ist. Dies ist besonders schön durch das Roentgenbild nachzu-
weisen, während im Uebrigen konstatiert werden muss, dass die Roent-
gen-Untersuchungen sonst wenig zur Differentialdiagnose in diesen
Fällen bieten. Das Oliver-Cardarelli Symptom, der Zug nach abwärts,
von Kehlkopf und Trachea, bei leicht zurückgebeugtem Kopfe, mag in
Bezug auf Aneurysma von Nutzen sein. Schliesslich mögen noch die
charakteristischen Zellen im Sputum für die sonst unmögliche Dia-
gnose ausschlaggebend sein.

c) *Form pleurétique.* Bei dieser Form der Erkrankung über-
wiegen die Symptome von Seite der Pleura und es kann vorkommen,
dass Schmerzen in Brust und Schulter, sowie immer sich wieder er-
neuernde Pleuraergüsse die Symptome von Seite der Lunge fast ganz
verdecken. Handelt es sich um Lungengeschwülste, so gehört diese
Form auch den späteren Entwicklungsstadien an. Dagegen sind ge-
rade diese Pleurasymptome die gewöhnlichste und frühzeitigste Er-
scheinungsweise der primären Pleurageschwulst. Mit diesen letzteren
haben wir uns aber hier nicht zu befassen.

Die Diagnose kann unter Umständen recht schwierig werden und
bedarf auf alle Fälle einer längeren Beobachtung. Es ist genügend be-
kannt, das sanguinolente Ergüsse in der Pleura nicht nur bei malignen
Geschwülsten, sondern auch ebenso gut bei Tuberkulose vorkommen
können. In seltenen Fällen kann sogar blutiger Pleuraerguss bei ganz
gutartigen Pleuritiden, z. B. bei Masern, vorkommen. Gerade bei
maligner Geschwulst ereignet es sich häufiger, dass bei den ersten
Thoracocentesen ganz klares, gelbes Serum gefunden wird, manchmal
in sehr grossen Mengen, und dass erst bei späteren Aspirationen das
Serum blutig, häufig dick und chokoladenartig erscheint. Dies ist
geradezu charakteristisch für Tumor.

Es ist die Regel, dass die Pleura in diesen Fällen sich trotz wieder-
holter und gründlicher Entleerung immer wieder von Neuem und zwar
ziemlich rasch anfüllt, so dass, um die quälende Dyspnoea zu mildern,
die Aspirationen in kurzen Intervallen bis zu Ende wiederholt werden
müssen. Es sind aber auch einzelne Ausnahmen von dieser Regel
bekannt. Unverricht (Beiträge zur klinischen Geschichte der krebsi-
gen Pleuraergüsse. Zeitschrift für klinische Medicin, Band IV, 1882,
S. 79) berichtet den Fall einer Frau, bei welcher nach zwei Aspiratio-
nen, die jedes Mal sanguinolente Flüssigkeit ergaben, alle Symptome

anscheinend verschwanden, sie schien sich vollkommen wohl zu fühlen, nahm an Gewicht zu, bis metastatische Geschwülste in den Stichkanälen auftraten. Die Section ergab primären Bronchialkrebs. Auch Hampeln berichtet einen ähnlichen Fall. Die bakteriologische Untersuchung der pleuritischen Flüssigkeit liefert keine diagnostisch wichtigen Punkte, dagegen ergibt die zytologische Untersuchung häufig, jedoch nicht immer, Verwendbares. Das Auftreten vereinzelter Epithelzellen hat keine Bedeutung. Die grossen, gequollenen und vacuolisierten Endothelien, die Fränkel beschreibt, scheinen charakteristisch für Pleuraendotheliom zu sein und nicht bei Lungengeschwulst vorzukommen. Zuweilen aber finden sich zusammenhängende Verbände und Nester epithelialer Zellen, die, besonders wenn dieselben eine ausgesprochene Glycogenreaktion zeigen, auf Carcinom hinweisen. In einigen Fällen hafteten der Punktionsnadel kleine Geschwulstpartikel an, welche, in Schnitte zerlegt, die mikroskopische Untersuchung und damit die absolute, sichere Diagnose ermöglichten. Darauf fussend, hat Krönig eine Methode angegeben, welche dazu dienen sollte, in jedem zweifelhaften Falle durch Aspiration kleine Tumorteilchen zu entfernen. Da diese Methode nicht ohne ihre Gefahren zu sein scheint und wohl auch nicht immer zum Ziele führt, hat dieselbe bisher keine allgemeine Anerkennung gefunden. Es dürfte rationeller sein, wie dies auch in einer Anzahl von Fällen schon geschehen ist, die Pleura direkt durch Schnitt zu eröffnen und damit nicht nur die Diagnose zu sichern, sondern auch gleichzeitig durch permanente Drainage, wenn nicht zu heilen, so doch einige der heftigsten Beschwerden zu mildern.

In den gewöhnlichen Fällen von gutartigem Pleuraerguss tritt meistens sofort nach Entleerung der Flüssigkeit ausgiebige Erleichterung aller Beschwerden ein. Es ist diagnostisch wichtig, dass bei Lungengeschwülsten nach Entleerung des Pleuwergusses diese Erleichterung nur in ganz geringem Maasse oder auch gar nicht, besten Falls nur auf ganz kurze Zeit eintritt. Die Dyspnoea, der Husten, der Auswurf und das allgemeine Krankheitsgefühl bestehen ruhig weiter. Es ist weiter noch zu bemerken, dass eine Rekurrenzparalyse auf derselben Seite, auf welcher sich der Pleuraerguss befindet, als sicheres Zeichen eines bösartigen Tumors aufgefasst werden darf.

d) Form pleuretique sans epanchement. Auch diese Form gehört einem recht späten Stadium der Erkrankung an. Es finden sich alle Zeichen eines pleuritischen Ergusses, Schmerz, absolut leerer Perkussionsschall, totale Abwesenheit irgendwelchen

Atemgeräusches and Stimmfremitus, respiratorische Unbeweglichkeit, vergrösserter Umfang der betreffenden Brustseite, Verlagerung des Herzens, aber sorgfältigste und wiederholte Punktion kann keine Flüssigkeit zu Tage fördern. Man hat das Gefühl, dass die Nadel in eine feste Masse eindringt und zwar bis zu solcher Tiefe, dass eine blos verdickte Pleura ausgeschlossen erscheint. Auch hier haften der Nadel öfters Geschwulstpartikel an. Sehr bezeichnend für diese Fälle ist die Tatsache, dass, während Atmungsgeräusche vollkommen fehlen, man die Herzgeräusche mit grösster Deutlichkeit hören kann, so dass, wenn z. B. die Geschwulst die rechte Brustseite einnimmt, man über diese ganze Region, vorne, sowie hinten, die Herztöne deutlich hören kann. Schon dies Zeichen allein genügt, um sicherzustellen, dass es sich hier um eine solide Geschwulst handelt. So viel bekannt, sind diese Fälle immer Sarcom und sollten keine allzu grossen diagnostischen Schwierigkeiten bieten.

Als Resultat des eben kurz skizzierten diagnostischen Materials scheint es sich zu ergeben, dass die alte Regel: *"Opportet omnia signa contemplari"* hier, wie vielleicht in keinem anderen Kapitel der klinischen Medizin, zum leitenden Prinzip erhoben werden muss. Es gibt kein einziges konstantes und immer gleich erscheinendes pathognomonisches Zeichen. Es werden wohl Fälle genug vorkommen, wo die Diagnose überhaupt nicht gestellt werden kann, Fälle, bei denen die Initialsymptome so geringfügig sind, dass der Patient einen Arzt gar nicht aufsucht und erst dann ärztliche Hilfe beansprucht, wenn cerebrale oder abdominelle Mestasen derartig in den Vordergrund des klinischen Bildes getreten sind, dass alle Möglichkeit, die primäre Geschwulst festzustellen, ausgeschlossen erscheint und jeder Versuch einer exakten Diagnose vergeblich und nutzlos ist. In sehr vielen Fällen aber, vielleicht in der Mehrzahl, wird es möglich sein, durch gründliche und wiederholte Untersuchung, durch vorsichtige Beobachtung und Deutung aller Symptome und mit Heranziehung aller zur Verfügung stehenden diagnostischen Hilfsmittel eine Diagnose, wenn auch nicht mit absoluter Sicherheit, so doch mit höchster Wahrscheinlichkeit zu erreichen. Beherzigenswert sind die Worte von Stokes, mit welchen er seinen klassischen Artikel über Lungengeschwülste schliesst: "Though none of the physical signs in this disease are, separately considered, peculiar to it, yet their combination and modes of succession are not seen in any other affection of the lung."

Es sind jetzt etwa hundert Jahre, dass Heyfelder (Studien im

Gebiete der Heilwissenschaft, Band I, S. 52), der es nicht mehr mit ansehen konnte, wie diese Unglücklichen unter allen möglichen Diagnosen, durch die damals moderne Behandlung mit Aderlässen, Purgantien, Salivationen u. s. w., u. s. w. gequält wurden, die Aerzte anfleht, doch endlich einmal diese Fälle als Krebs und somit als hoffnungslos zu erkennen und das Leiden, das durch die Krankheit hervorgerufen wird, nicht noch durch barbarische Behandlungsmethoden zu steigern. *"Optima hic est medicina medicinam non facere."*

Es sind kaum fünf Jahre her, dass Benda (Zur Erkenntnis des Pflasterzellenkrebses der Bronchien. Deutsche Medicinische Wochenschrift 1904, S. 1454) mit voller Berechtigung sagen konnte, dass der Lungenkrebs eine ganz besondere Stellung einnehme, insofern, als derselbe die einzige Krebsform sei, die dem Chirurgen durchaus unzugänglich wäre. Er ging aber noch einen Schritt weiter, indem er hinzufügte, dass, sei auch der Fortschritt der chirurgischen Technik noch so gross, es aber doch immer·unmöglich bleiben werde, die Diagnose auf Lungenkrebs so frühzeitig zu stellen, dass irgend eine Aussicht auf Erfolg durch chirurgische Behandlung zu erwarten wäre. Dies ist aber wieder einmal ein glänzender Beweis, wie unstatthaft es ist. dem Fortschritt der Wissenschaft Grenzen zu setzen. Innerhalb der wenigen Jahre, die seit diesem Ausspruch Benda's verflossen sind, hat sich die Sachlage gänzlich verändert. Bis vor Kurzem bedeutete die Diagnose einer bösartigen Lungengeschwulst zugleich das Todesurteil des Patienten. Es war hauptsächlich ein rein theoretisches und wissenschaftliches Interesse, das die Feststellung der Diagnose einer Lungengeschwulst beanspruchen konnte. Es ist auch nicht zu verwundern, dass die Aerzte im Allgemeinen einer Erkrankung, die nicht die geringste Aussicht auf therapeutischen Erfolg bot, so wenig Interesse entgegenbrachten. Das hat sich Alles, wie mit einem Schlage, geändert. Wir stehen im Anfange einer neuen Aera der Lungenchirurgie, welche mit Hilfe der Sauerbruch'schen Kammer und des Druckdifferenzverfahrens zu grossen Hoffnungen berechtigt und auch für diese Fälle von Lungengeschwulst — bis jetzt so hoffnungslos — scheint eine bessere Zukunft zu dämmern. Schon sind eine Anzahl einschlägiger Fälle, besonders von Lenhartz und Kümmel, berichtet, die nach den neuen Methoden operiert sind, mit Resultaten, die zu gut begründeten Hoffnungen für die Zukunft berechtigen. Lenhartz berichtet über einen Fall von bösartigstem Bronchialcarcinom, in ganz verzweifeltem Zustande operiert. Die Operation wurde gut über-

standen und nach dem letzten Bericht, ein volles Jahr nach der Operation, befand sich der Patient noch wohl. Der Tod trat 2½ Jahre nach der Operation ein.

Dieser neue Zweig der Chirurgie ist selbstverständlich noch in seiner Kindheit, aber schon ist man berechtigt, der Zeit entgegenzublicken, in welcher der Thorax in ähnlicher Weise dem chirurgischen Eingriff zugänglich sein wird, wie es heute die Bauchhöhle ist. Wenn dem so ist, so übernimmt die innere Medizin eine neue und schwere Verantwortlichkeit. Es wird die heilige Pflicht des Arztes sein, die Lungengeschwulst nicht nur zu erkennen, sondern auch so frühzeitig als nur immer möglich zu erkennen.

Die Fälle sind vorhanden, sie können gefunden werden, sie werden aber nur dann gefunden, wenn man darnach sucht. Der Arzt muss sich bewusst bleiben, dass die bösartigen Lungengeschwülste viel häufiger vorkommen, als man bisher geglaubt hat, und dass sie zu irgend einer Zeit, bei Jung oder Alt vorkommen können. Gerhardt hat schon längst geraten, bei jedem älteren Individuum, bei dem blutiger Auswurf vorkommt und bei welchem Herzkrankheiten und Tuberkulose ausgeschlossen werden können, einen Lungenkrebs zu vermuten. Aber kein Lebensalter ist immun, und man sollte jederzeit die Möglichkeit einer malignen Lungengeschwulst vor Augen haben. Es scheint sogar, selbst nach dem heutigen Stande der Technik, nicht zu weit gegangen, wenn man behauptet, dass, wo die Sputa, die Roentgenstrahlen, das Bronchoskop und alle anderen diagnostischen Hilfsmittel nicht zum Ziele führen, es jetzt schon indiziert ist, bei verdächtigen Fällen die explorative Thoracotomie zu empfehlen. Es ist sicherlich besser, in geeigneten Fällen nach den neuen Methoden den Thorax zu eröffnen und Sicherheit, eventuell Heilung, zu erlangen, als zu warten, bis die Diagnose auf andere Weise sichergestellt, der Patient aber verloren ist.